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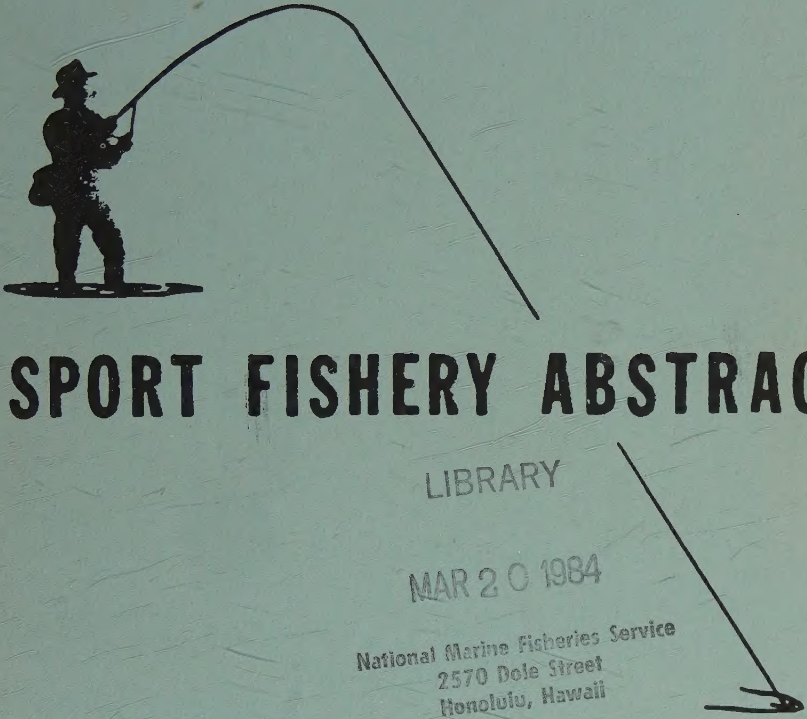

SPORT FISHERY ABSTRACTS

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SPORT FISHERY ABSTRACTS

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Sport Fishery Abstracts is intended to furnish fishery biologists with abstracts of current literature in sport fishery research and management.

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SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

Volume 28(4) 1983

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Camera copy for this issue of SPORT FISHERY ABSTRACTS has been generated by computer programs developed by the Editorial Office, U.S. Fish and Wildlife Service, Fort Collins, CO.

AQUATIC PLANTS AND THEIR CONTROL

83-001995 Crivelli, A. J. THE DESTRUCTION OF AQUATIC VEGETATION BY CARP: A COMPARISON BETWEEN SOUTHERN FRANCE AND THE UNITED STATES. *Hydrobiologia* 106(1):37-41. 9 Sept. 1983. SFA 28(4)

[Stn. Biol. Tour Valat, Le Sambuc, 13200 Arles, France] The destruction of submerged vegetation by common carp, *Cyprinus carpio* L. is tested in six enclosures with different biomass (kg ha^{-1}) of carp in a marsh of the Camargue, southern Frence. After 71 days, a strong negative relationship was found between the biomass of carp and the amount of aquatic vegetation present in the enclosures. The results are compared with similar studies in the United States. The absence of problem of vegetation destruction by carp in Europe, in contrast to North America, may be explained by lower biomass of these populations in Europe, and by a higher weight of carp in North America.

GENERAL FISH CULTURE

83-001996 Baugh, T. M. EGG DEVELOPMENT APPARATUS. *J. Aquaricult. Aquatic Sci.* 3(3):46-50. 1983. SFA 28(4)

[Dep. Biol. Sci., Univ. Nevada, 4505 Maryland Parkway, Las Vegas 89154] Investigation of the embryological development of small, nongame fish eggs can be faciliated by the apparatus described. The apparatus is inexpensive, easy to construct, and allows constant aeration and agitation of individual eggs.

83-001997 Billard, R. STERILIZATION, SEX INVERSION AND IDENTIFICATION OF SEX IN FISH REARED IN FISH FARMS. *Riv. It. Piscic. Ittiop.* 18(2):45-58. Apr.-June 1983. In English and Italian. SFA 28(4)

[Lab. Physiol. Poissons, I.N.R.A., 78350 Jouy-en-Josas, France]

83-001998 Ross, F. E. ANALYSIS OF THE ECONOMIC VIABILITY OF THE GOVERNMENT OF JAMAICA/USAID INLAND FISHERIES PROJECT. *Ph.D. dissertation, Auburn Univ.* 198p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(1):6. July 1983. SFA 28(4)

TROUT AND SALMON CULTURE

83-001999 Gjerde, B.; K. Gunnes and T. Gjedrem. EFFECT OF INBREEDING ON SURVIVAL AND GROWTH IN RAINBOW TROUT. *Aquaculture* 34(3-4):327-332. Aug. 1983. SFA 28(4)

[Dep. Anim. Genet. Breeding, Agric. Univ. Norway, 1432 Ås-NLH, Norway] The effect of three levels of inbreeding (F=0.25, F=0.375 and F=0.50) on survival and growth in rainbow trout (*Salmo gairdneri*) has been studied. At each level the inbreeding depression for survival of eyed eggs, alevins and fry was highly significant, but no linear relationship was found between level of inbreeding and inbreeding depression. Over all levels of inbreeding the average inbreeding depression was found to be 10.0% for survival of eyed-eggs, 5.3% for alevins and 11.1% for fry. For growth of fingerlings at an age of 160 days after first feeding, no significant inbreeding depression was found at any of the inbreeding levels studied. For growth of adults after a seawater period of about 18 months, a highly significant inbreeding depression was found at each level of inbreeding. An increasing growth depression with increasing inbreeding was also observed. Thus, per 10% of the inbreeding coefficient, the inbreeding depression was found to be 4.5% at F=0.25, 5.3% at F=0.375 and 6.1% at F=0.50.

TROUT AND SALMON CULTURE (CONTINUED)

83-002000 Huner, J. V. LAXFORSEN - A COMMITTMENT TO SALMONID AQUACULTURE. *Aquacult. Mag.* 9(6):24-28. Sept.-Oct. 1983. SFA 28(4)

83-002001 Johnson, S. C.; G. A. Chapman and D. G. Stevens. SENSITIVITY OF STEELHEAD TROUT EMBRYOS TO HANDLING. *Prog. Fish-Cult.* 45(2):103-104. Apr. 1983. SFA 28(4)
[U.S. EPA Environ. Res. Lab., 1350 S. E. Goodnight, Corvallis, OR 97333]

83-002002 Kazakov, R. V.; Y. P. Zelinskiy and Y. A. Smirnov. [SELECTIVE BREEDING AND GENETIC INVESTIGATION OF THE ATLANTIC SALMON WITH REFERENCE TO THEIR POPULATION STRUCTURE AND KARYOLOGICAL CHARACTERISTICS.] *Proc. All-Union Meet. Genet. Sel. Breed. Hybridization Fish.* 2:83-86. 1983. In Russian with English summ. SFA 28(4)

83-002003 Kubo, T. [GROWTH-RATE AND SMOLTING-RATE OF ANADROMOUS "MASU" SALMON (*ONCORHYNCHUS MASOU*) JUVENILES UNDER ARTIFICIAL CONDITIONS.] *Sci. Rep. Hokkaido Salmon Hatchery* No. 37. p. 23-39. Mar. 1983. In Japanese with English summ. SFA 28(4)
[Nanae Fish-Cult. Exp. Stn., Fac. Fish., Hokkaido Univ., Nanae, Hokkaido, Japan]

83-002004 Papst, M. H. and G. E. Hopky. GROWTH OF ARCTIC CHARR (*SALVELINUS ALPINUS* L.) IN A PILOT COMMERCIAL REARING SYSTEM. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1182. iv + 16p. July 1983. In English with French summ. SFA 28(4)
[Dep. Fish. Oceans, Winnipeg, MB R3T 2N6, Canada] Preliminary experiments to determine the feasibility of the intensive culture of Arctic charr (*Salvelinus alpinus* L.) are described. After 209 days of growth in a pilot commercial fish production system, at 13C, the mean weight of individuals in the population increased from 2.2 to 158.1 g. On day 209 a wide variation in body weights, from 10 to 530 g was observed. Despite significantly larger mean weights, growth rates of the largest fish were comparable to those observed for other members of the population. Smallest fish in the population had minimal to nil weight gains. Rearing of the population as three separate weight classes ("small", "medium" and "large"), during the last 48 days of the growth trial did not result in improved growth of the smallest fish. There was no increase in the dispersion (coefficient of variation) of body weights in either the "medium" or "large" weight classes, compared to a marked increase in the dispersion of the "small" weight classes' distribution. This latter effect was in part attributable to precocious maturity among the smallest of the males. Mortality in the Arctic charr population was not significant, and was comparable to that previously observed in rainbow trout pilot production trials. Between days$_1$70 to 154 the mean growth rate of the Artic charr population was 1.9% Day$^-$ compared to 1.4 and 1.9% Day$^-$ for two rainbow trout strains previously reared in the pilot system under similar conditions.

83-002005 Rosenberg, D. L. FERTILIZATION SUCCESS OF COHO SALMON GAMETES: EFFECTS OF STORAGE UNDER VARIOUS ATMOSPHERIC CONDITIONS, TEMPERATURE ACCLIMATION, AND TEMPERATURE VARIATIONS. *Prog. Fish-Cult.* 45(2):84-87. Apr. 1983. SFA 28(4)
[P.O. Box 97, Klawock, AK 99925]

TROUT AND SALMON CULTURE (CONTINUED)

83-002006 Utter, F. M.; O. W. Johnson; G. H. Thorgaard and P. S. Rabinovitch. MEASUREMENT AND POTENTIAL APPLICATIONS OF INDUCED TRIPLOIDY IN PACIFIC SALMON. *Aquaculture* 35(2):125-135. Oct. 1983. SFA 28(4)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 99164]

WARMWATER CULTURE

83-002007 Applegate, R. L. *BIDENS* ACHENES CAUSE MORTALITY IN YOUNG MUSKELLUNGE AND WALLEYES. *Prog. Fish-Cult.* 45(2):107. Apr. 1983. SFA 28(4)
[S. Dak. Coop. Fish. Res. Unit, S. Dak. State Univ., Brookings 57006]

83-002008 Berrios-Hernandez, J. M. and J. R. Snow. COMPARISON OF METHODS FOR REDUCING FRY LOSSES TO CANNIBALISM IN TILAPIA PRODUCTION. *Prog. Fish-Cult.* 45(2):116-118. Apr. 1983. SFA 28(4)
[Dep. Fish., Minist. Nat. Resour., Tegucigalpa, Honduras]

83-002009 Billard, R.; J. P. Choisis and P. Reinaud. STIMULATION OF SPERMIATION IN CARP IN RESPONSE TO LH-RH AND D-ALA^6-LH-RH ETHYLAMIDE. *Aquaculture* 35(2):173-176. Oct. 1983. SFA 28(4)
[Lab. Physiol. Poissons, INRA, 78350 Jouy-en-Josas, France]

83-002010 Bondari, K. EFFICIENCY OF MALE REPRODUCTION IN CHANNEL CATFISH. *Aquaculture* 35(1):79-82. Sept. 1983. SFA 28(4)
[Dep. Entomol. Fish., Coastal Plain Exp. Stn., Univ. Ga., Tifton 31793]
Efficiency of male reproduction in channel catfish (*Ictalurus punctatus*) was studied by stocking 24 female brooders in each of four 0.1-ha square ponds. Male brooders were added to the four ponds to give male to female ratios of 1:1, 1:2, 1:3, and 1:4. Ten 38-l milk cans were placed in each pond and checked for the presence of eggs two or three times per week during a 33-day spawning period. Results indicated no differences in the number of spawns produced, spawn weight, egg weight, or hatching traits among the four ponds. The number of days required for a spawn to be produced was longer at the higher male to female ratios.

83-002011 Braga, R. Â. INDUÇÂO DE DESOVA DE SARDINHA, "TRIPORTHEUS ANGULATUS ANGULATUS" (SPIX) POR HIPOFISAÇÂO. [INDUCED MATURATION IN SARDINE, *TRIPORTHEUS ANGULATUS ANGULATUS* (SPIX) WITH HYPOPHYSIS.] *Bol. Tec. Dep. Nac. Obras Contra Secas* 40(2):165-174. July-Dec. 1982. In Portugese with English summ. SFA 28(4)
[Serv. Pisicultura, Dep. Nac. Obras, Contra as Sêcas, Fortaleza, Ceará, Brazil]

83-002012 Busch, R. L. EVALUATION OF THREE SPAWNING CONTAINERS FOR CHANNEL CATFISH. *Prog. Fish-Cult.* 45(2):97-99. Apr. 1983. SFA 28(4)
[Delta Br., Miss. Agric. For. Exp. Stn., Stoneville 38776]

83-002013 Carmichael, G. J. and J. R. Tomasso. USE OF FORMALIN TO SEPARATE TADPOLES FROM LARGEMOUTH BASS FINGERLINGS AFTER HARVESTING. *Prog. Fish-Cult.* 45(2):105-106. Apr. 1983. SFA 28(4)
[U.S. FWS, Rt. 1, Box 159-D, San Marcos, TX 78666]

WARMWATER CULTURE (CONTINUED)

83-002014 Colesante, R. T. and N. B. Youmans. WATER-HARDENING WALLEYE EGGS WITH TANNIC ACID IN A PRODUCTION HATCHERY. *Prog. Fish-Cult.* 45(2):126-127. Apr. 1983. SFA 28(4)
[N. Y. State Dep. Environ. Conserv., Oneida Hatchery Res. Unit, Constantia 13044]

83-002015 Conrad, J. ROTATING CATFISH WITH RICE. *Aquacult. Mag.* 9(6):29-30. Sept.-Oct. 1983. SFA 28(4)

83-002016 Ellison, D. G.; J. A. Gleim and D. Kapke. OVERWINTERING THREADFIN SHAD THROUGH INTENSIVE CULTURE. *Prog. Fish-Cult.* 45(2):90-92. Apr. 1983. SFA 28(4)
[Lake McConaughy Fish Res. Lab., Nebr. Game Parks Comm., Ogallala 69153]

83-002017 Flynn, J. B.; N. R. Martin, Jr. and G. D. Hanson. EFFECT OF PRODUCTION AND CREDIT MANAGEMENT FACTORS ON CATFISH INVESTMENT AND PROFITABILITY. *Ala. Agric. Exp. Stn. Bull.* 548. 27p. June 1983. SFA 28(4)
[Available from Ala. Agric. Exp. Stn., Auburn Univ., Auburn, AL]

83-002018 Gorbacheva, L. G.; L. V. Badenko; N. G. Dorosheva and L. A. Krapivina. [THE EFFICIENCY OF ARTIFICIAL PROPAGATION OF STURGEONS IN THE AZOV SEA-DON RIVER AREA.] *Biological Productivity in the Azov and Caspian Seas. VNIRO, Moscow, USSR.* p. 53-64. 1982. In Russian with English summ. SFA 28(4)

83-002019 Goudie, C. A.; B. D. Redner; B. A. Simco and K. B. Davis. FEMINIZATION OF CHANNEL CATFISH BY ORAL ADMINISTRATION OF STEROID SEX HORMONES. *Trans. Am. Fish. Soc.* 112(5):670-672. Sept. 1983. SFA 28(4)
[Southeast. Fish Cult. Lab., U.S. FWS, Marion, AL 36756]

83-002020 Hogendoorn, H. and W. J. Koops. GROWTH AND PRODUCTION OF THE AFRICAN CATFISH, *CLARIAS LAZERA* (C.& V.). I. EFFECTS OF STOCKING DENSITY, POND SIZE AND MIXED CULTURE WITH TILAPIA (*SAROTHERODON NILOTICUS* L.) UNDER EXTENSIVE FIELD CONDITIONS. *Aquaculture* 34(3-4):253-263. Aug. 1983. SFA 28(4)
[Dep. Fish. Cult. Inland Fish., P.O. Box 338, Wageningen, Netherlands]
Growth and production of *C. lazera* (C.& V.) and *S. niloticus* L. in mono- and mixed culture were studied in relation to stocking density and pond size using a low grade feed. The biomass after 24 weeks ranged from 16 to 115 $g \cdot m^{-2}$ for tilapia and from 50 to 266 $g \cdot m^{-2}$ for *C. lazera*. Independent of the other treatments, the use of *C. lazera* resulted in more than 2.5-fold increase in the biomass as compared with tilapia. For both species the biomass increased with increasing stocking density, but the individual weight was greatly reduced. The growth of neither tilapia nor *C. lazera* was found to be affected by the presence of the alternate species, indicating the absence of interspecies competition. Increased pond size resulted in a lower biomass of tilapia, while the growth of *C. lazera* was independent of the pond size.

83-002021 Hogendoorn, H.; J. A. J. Jansen; W. J. Koops; M. A. M. Machiels; P. H. Van Ewijk and J. P. Van Hees. GROWTH AND PRODUCTION OF THE AFRICAN CATFISH, *CLARIAS LAZERA* (C.& V.) II. EFFECTS OF BODY WEIGHT, TEMPERATURE

WARMWATER CULTURE (CONTINUED)

83-002021 CONTINUED AND FEEDING LEVEL IN INTENSIVE TANK CULTURE. *Aquaculture* 34(3-4):265-285. Aug. 1983. SFA 28(4)
[Dep. Fish. Cult. Inland Fish., P.O. Box 338, Wageningen, Netherlands] An experiment including 273 separate trials was carried out in densely stocked 150-l aquaria to study the growth response of *C. lazera* (C.& V.) weighing about 0.5, 5, 25 and 125 g to five different feeding levels from feed deprivation to satiation at 20, 25, 27.5, 30, 32.5, and 35°C. Analyses of dry matter, energy and nitrogen content were made in samples of the feed and of the fish to determine the feed utilization. It was found that *C. lazera* is highly suitable for high density, intensive aquaculture, because of its rapid growth and efficient feed utilization. The specific growth rate decreased from a maximum of 11% per day for small fish at 30°C to a maximum of 2% per day for the largest size group at 25°C. The corresponding maximum feed conversion efficiency decreased from 170 to 100%. A model was developed to describe the feed utilization for growth on a dry and on a fresh weight basis. Winberg's balanced energy equation: $d\,W/dt=p\cdot R-H$ and Pütter's original growth concept equating growth to the difference between anabolic and catabolic activities both related to the body weight already achieved: $dW/dt=k_1W^m-k_2W^n$, were used as a basis for the model. It was found that the feed utilization was independent of feeding level and temperature. It was also independent of body weight in the case of the dry weight feed utilization. For the fresh weight, the feed utilization decreased exponentially with increasing body weight, probably because the dry matter content of the fish increased allometrically with body weight. Temperature optima were found for k_1 and m while k_2 increased not quite exponentially with temperature and n was constant. These findings complied with or supported related findings in the literature and could be interpreted biologically. The model was used to predict the growth of *C. lazera* as a response to the feed ration in relation to temperature and body weight. A table of recommended feeding levels for *C. lazera* was established.

83-002022 Konstantinov, A. S. EFFECT OF INDIVIDUAL SPECIES-SPECIFIC EXOMETABOLITES ON FISH GROWTH. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(1):103-114. 1983. SFA 28(4)
[Biol. Fac., Moscow State Univ., Moscow, USSR]

83-002023 Kuznetsov, E. A. [BACTERIOPLANKTON IN CASCADE OF FISH PONDS WITH DEPENDENT WATERSUPPLY.] *Biol. Nauki (Mosc.)* 235(7):74-78. 1983. In Russian with English summ. SFA 28(4)

83-002024 Luchini, L. and C. C. Rangel. REPRODUCCION INDUCIDA Y DESARROLLO LARVAL DEL "BAGRE NEGRO", *RHAMDIA SAPO* (VAL.) EIG. [INDUCED SPAWNING AND LARVAL DEVELOPMENT OF THE "BLACK CATFISH", *RHAMDIA SAPO* (VAL.) EIG.] *Rev. Asoc. Cienc. Nat. Litoral.* No. 12. p.1-7. 1981. In Spanish with English summ. SFA 28(4)
[Inst. Nac. Invest. Desarr. Pesq., Casilla de Correo 175, 7600 Mar del Plata, Argentina]

83-002025 McGee, M. V. and C. E. Boyd. EVALUATION OF THE INFLUENCE OF WATER EXCHANGE IN CHANNEL CATFISH PONDS. *Trans. Am. Fish. Soc.* 112(4):557-560. July 1983. SFA 28(4)
[Dep. Fish. Allied Aquacult., Auburn Univ., AL 36849]

83-002026 Michaletz, P. H.; C. F. Rabeni; W. W. Taylor and T. R. Russell. FACTORS AFFECTING *DAPHNIA* DECLINES IN PADDLEFISH REARING PONDS. *Prog. Fish-Cult.* 45(2):76-80. Apr. 1983. SFA 28(4)
[S. Dak. Game Fish Parks Dep., Yankton 57078]

WARMWATER CULTURE (CONTINUED)

83-002027 Monaco, G. and S. I. Doroshov. MECHANICAL DE-ADHESION AND INCUBATION OF WHITE STURGEON EGGS (*ACIPENSER TRANSMONTANUS* RICHARDSON) IN JAR INCUBATORS. *Aquaculture* 35(2):117-123. Oct. 1983. SFA 28(4)

[Aquacult. Prog., Dep. Anim. Sci., Univ. Calif., Davis 95616] Eggs obtained from five white sturgeon females were fertilized manually and subjected to manual and mechanical de-adhesion by silt coating in jar incubators (described). Embryos resulting from both manual and mechanical de-adhesion yielded similar survival from fertilization to hatch (57 and 54% respectively). Fertilization concomitant with a mechanical silt coating resulted in significantly lower embryonic survival as compared to a manual treatment (4 and 40% respectively).

83-002028 Sathyanarayana Rao, H. N. and G. P. Satyanarayana Rao. HORMONAL MANIPULATION OF SEX IN THE COMMON CARP, *CYPRINUS CARPIO* VAR. *COMMUNIS* (LINNAEUS). *Aquaculture* 35(1):83-88. Sept. 1983. SFA 28(4)

[Univ. Agric. Sci., Coll. Fish., Mangalore - 575 002, India] Attempts were made to manipulate the sex of the common carp, *Cyprinus carpio*, by dietary administration of 17α-methyl-testosterone (17α-MT) (220 ppm) and 17β-estradiol (17β-E_2) (200 ppm) for 131 days starting with one-day-old hatchlings. Administration of 17α-MT and 17β-E_2, in general, retarded gonadal development and altered the sex ratio significantly. The 17α-MT treated group had 46% male and 54% sterile forms while the 17β-E_2 treated group had 15% male, 42% female and 43% sterile forms. The sex ratio of control fish was unaltered and had a more or less normal sex composition of almost 50% males and 50% females.

83-002029 Simpson, H. J.; H. W. Ducklow; B. Deck and H. L. Cook. BRACKISH-WATER AQUACULTURE IN PYRITE-BEARING TROPICAL SOILS. *Aquaculutre* 34(3-4):333-350. Aug. 1983. SFA 28(4)

[Lamont-Doherty Geol. Observ., Columbia Univ., Palisade, NY 10964] Oxidation of pyrite in soils and sediments of coastal areas yields large amounts of acid, as well as soluble iron and aluminum, which seriously reduce yields of aquaculture organisms. Potential for this problem is widespread in tropical and subtropical areas, especially for brackish-water aquaculture in Southeast Asia. Data on water, sediment and soil chemistry at a new aquaculture facility in peninsular Malaysia are reported to document environmental conditions during the initial years of operation when the yields of food organisms are low. Estimated rates of leaching of acid from the pyrite-bearing dike soils suggest that acidity problems will probably persist at this facility for a number of years. Possible ways to minimize such problems are described.

83-002030 Spotts, D. HIGH DENSITY TILAPIA CULTURE TAIWAN. *Aquacult. Mag.* 9(6):21-23. Sept.-Oct. 1983. SFA 28(4)

83-002031 Williams, S. B. GROUNDWATER DEMANDS ASSOCIATED WITH CATFISH PRODUCTION IN WEST-CENTRAL ALABAMA. *Ph.D. dissertation, Auburn Univ.* 117p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(1):6. July 1983. SFA 28(4)

Problems of water supply associated with catfish production during periods of limited rainfall have led to increases in the use of groundwater as a supplemental water source for the maintainance of pond volumes. This study analyzed the water resource availability for catfish production in west-central Alabama. Several alternatives (hill ponds requiring supplementary water from subsurface aquifers; diked and hill ponds using a water storage reservoir as an alterantive to pumping from subsurface aquifers; oversized ponds designed to retain a prescribed minimum water volume) were developed and evaluated on the basis of economic feasibility.

WARMWATER CULTURE (CONTINUED)

83-002031 CONTINUED Enterprise budgets were generated for each of the several alternative water systems; net returns varied from -$76 to $779 per hectare depending on the alternative water system employed. Benefit/cost ratios for all pond sizes were relatively greater than 1. However, the benefit/cost analysis indicated that an 8-hectare "gravity flow" pond system was most economical. Projecting growh in catfish production is difficult. Netherless, assuming a 4.0 percent annual growth in pond numbers and a continuity of reasonably favorable prices not less than $1.11 per kilogram, a 34 percent growth in the number of catfish production ponds is expected by 1990. This projection means 169 more ponds will probably be constructed over the next eight years in the study area of west-central Alabama covered in this report. Total water demand in the study area does not appear to a cause of concern for Alabama now or in the immediate future. Consequently, the catfish industry does not appear to be in danger with respect to aggregate water supply. However, economic analyses showed significant limitations with respect to water use due to high costs of lifting available water from aquifer depths documented in the study area.

83-002032 Zhmurova, E. K.; Z. N. Kravchenko and N. E. Vdovenko. [ON ARTIFICIAL PROPAGATION OF SEMI-ANADROMOUS SPECIES OF FISH IN THE AZOV SEA - DON RIVER AREA.] *Biological Productivity in the Azov and Caspian Seas. VNIRO, Moscow, USSR.* p. 88-93. 1982. In Russian with English summ. SFA 28(4)

MARICULTURE

83-002033 Austin, B. BACTERIAL MICROFLORA ASSOCIATED WITH A COASTAL, MARINE FISH-REARING UNIT. *J. Mar. Biol. Assoc. U.K.* 63(3):585-592. Aug. 1983. SFA 28(4)
[Fish Dis. Lab., Weymouth, Dorset, DT4 8UB, England]

83-002034 Chiba, K. THE EFFECT OF DISSOLVED OXYGEN ON THE GROWTH OF YOUNG SILVER BREAM. *Bull. Jpn. Soc. Sci. Fish.* 49(4):601-610. Apr. 1983. SFA 28(4)
[Fish. Lab., Univ. Tokyo, Maisaka, Shizuoka 431-02, Japan]

83-002035 Divanach, P. and M. Kentouri. INFLUENCE DES CONDITIONS TROPHIQUES INITIALES SUR LA RESORPTION DES RESERVES LIPIDIQUES, LA CROISSANCE ET LA SURVIE DES LARVES DE DAURADES, *SPARUS AURATUS*, EN ELEVAGE EXTENSIF. [THE INFLUENCE OF INITIAL TROPHIC CONDITIONS ON OIL GLUBULE RESORPTION, GROWTH AND SURVIVAL OF GILT HEAD SEA BREAM, *SPARUS AURATUS*, LARVAE IN EXTENSIVE BREEDING.] *Aquaculture* 35(1):43-55. Sept. 1983. In French with English summ. SFA 28(4)
[Stn. Biol. Mar. Lagunaire, Quai de Bosc Prolongé, 34200 Sète, France] Seven trials are described in which larval gilt head sea bream, *Sparus auratus*, was reared in extensive conditions. Food was provided initially from an endogenous plankton bloom and then, as grazing increased to high levels, from an exogenous supply. Immediate rapid growth, high survival rates, slow oil globule resorption and easy weaning with exogenous plankton were obtained with a diet of pelagic marine ciliates and/or the rotifer, *Synchaeta triophthalma*. With *Branchionus plicatilis* or copepod nauplii, results were poor and close to those obtained in the unfed trial. There was a high mortality, slow growth, quick oil globule resorption and the survivors suffered a critical phase. With a mixture of mussel veligers and

MARICULTURE (CONTINUED)

83-002035 CONTINUED *Synchaeta littoralis*, feeding results were intermediate. The reasons for success or failure are discussed and predictions are made for the development of a rearing programme.

83-002036 Ochiai, A.; K. Mutsutani and S. Umeda. [ON THE FIRST YEAR'S GROWTH, MATURITY AND ARTIFICIAL SPAWNING OF CULTURED JACK MACKEREL.] *Bull. Jpn. Soc. Sci. Fish.* 49(4):541-545. Apr. 1983. In Japanese with English summ. SFA 28(4)
[Fac. Agric., Kochi Univ., Nan-Goku, Kochi 783, Japan] The cultural and spawning experiments of jack mackerel *Trachurus japonicus* (Temminck et Schlegel) from our hatchery were carried out from April 18, 1980 to July 16, 1981. The growth of the cultured fish was considerably high and the fish reached 17.4 cm in fork length and 67.0 g in weight in average at the end of its first year. The optimal temperature for the growth is ascertained to be between 18° and 26°C. All males are found to be spermiating without hormone injection in April and June, 1981. In some females the ovaries are well enlarged, with maturing eggs developed to primary or tertiary yolk stage in May and June, 1981. It is suggested that the cultured fish attained sexual maturity at least at a length of about 15 cm in fork length. Twenty six females and 25 males are treated with gonadotropin in May 26, 1981, and placed in a circular tank of about 6 ton capacity at the beginning of the spawning experiment. At the water temperature of about 21°C, spawning began at 32: 30 hr, and completed at 39: 45 hr after receiving gonadotropin. The fertilized eggs incubated at the water temperature of about 21°C began hatching at about 34: 40 hr after first spawning.

83-002037 Ohwada, K.; N. Tanaka and M. Sugiyama. PENETRATION OF MICROORGANISMS INTO DEPOSITED FISH SCALES IN THE SEDIMENT OF A COASTAL FINFISH CULTURE GROUNDS. *Bull. Jpn. Soc. Sci. Fish.* 49(4):657. Apr. 1983. SFA 28(4)
[Environ. Manage. Div., Natl. Res. Inst. Aquacult., Tamaki, Watarai, Mie 519-04, Japan]

83-002038 Teague, L. REDFISH FACTORY. *Tex. Parks Wildl.* 41(9):9-11. Sept. 1983. SFA 28(4)

FEEDS, FEEDING, AND NUTRITION

83-002039 Al-Ahmad, T. A. RELATIVE EFFECTS OF FEED CONSUMPTION AND FEED EFFICIENCY ON GROWTH OF CATFISH FROM DIFFERENT GENETIC BACKGROUNDS. *Ph.D. dissertation, Auburn Univ.* 86p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(1):1. July 1983. SFA 28(4)
The relative contribution of feed consumption and feed efficiency to growth rate was determined for catfish, *Ictalurus punctatus* from different genetic backgrounds including two crosses with *I. furcatus*. Nine genetic groups of fingerling catfish were fed to satiation under controlled conditions for 70 days and five of the genetic groups were fed to satiation under controlled conditions as yearling catfish for 95 days. Feed consumption and gains in weight, protein, fat and energy were measured. Digestibility of protein and energy in the diet was determined among the yearling catfish. Rapid growth of the catfish was attributable more to feed consumption than to efficiency of feed utilization. Feed consumption was 1.4 times more important than feed efficiency in accounting for weight gain

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

83-002039 CONTINUED of the fingerlings and 5.6 times more important in accounting for weight gain of the yearlings. During both the fingerling and yearling period, the genetic groups grew at significantly different (<.01) rates and consumed different (P<0.1) amounts of feed. However, there were significant differences (P<.01) in feed efficiency among the genetic groups only during the fingerling period and not during the yearling period. Also, weight gain was highly correlated (P<.01) with feed consumption during both the fingerling (r = .817 ± .155) and yearling (r = .984 ± .062) periods, while weight gain was highly correlated (P<.01) with feed efficiency only during the fingerling period (r = .605 ± .159) but not (P>.05) during the yearling period (r = .218 ± .345). Weight gain was a good indicator of growth and gain in body composition in terms of protein, fat and energy during both the fingerling and yearling periods as indicated by the high correlations between weight gain and the other gains. Feed efficiency was highly correlated (P<.01) with both protein and energy efficiencies during the fingerling period, and only correlated with protein efficiency (P<.01) but not energy efficiency during the yearling period. There was no significant difference (P>.05) in either crude protein or gross energy digestibility among the five yearling groups of catfish. Results of this study suggest that if catfish are selectively bred for improved growth rate or feed efficiency, the breeder cannot assume that the fish which grow fastest will have the best efficiency, or that the fish which are more efficient at feed utilization grow at a faster rate.

83-002040 Bergot, F. and J. Breque. DIGESTIBILITY OF STARCH BY RAINBOW TROUT: EFFECTS OF THE PHYSICAL STATE OF STARCH AND OF THE INTAKE LEVEL. *Aquaculture* 34(3-4):204-212. Aug. 1983. SFA 28(4)
[INRA, Lab. Nutr. Elevage Poissons, B.P. 3-Saint Pée-sur-Nivelle, 64310 Ascain, France]

83-002041 Czeczuga, B. and K. Dabrowski. RAPESEED MEAL IN THE DIET OF COMMON CARP REARED IN HEATED WATERS. V. CAROTENOIDS IN DIETS AND FISH TISSUES. *J. Anim. Physiol. Anim. Nutr.* 50(1-2):52-61. July 1983. In English with German summ. SFA 28(4)
[Inst. Biostrat., Med. Acad., 15-230 Bealystok, Poland]

83-002042 Dabrowski, K.; R. Bardega and R. Przedwojski. DRY DIET FORMULATION STUDY WITH COMMON CARP (*CYPRINUS CARPIO* L.) LARVAE. *J. Anim. Physiol. Anim. Nutr.* 50(1-2):40-52. July 1983. In English with German summ. SFA 28(4)
[Inst. Ichthyobiol. Fish., Acad. Agric. Technol., 10-957 Olszytyn-Kortowo, Poland]

83-002043 Degani, G. and D. Levanon. THE INFLUENCE OF LOW DENSITY ON FOOD ADAPTATION, CANNIBALISM AND GROWTH OF EELS (*ANGUILLA ANGUILLA* (L.)). *Bamidgeh* 35(2):53-60. June 1983. SFA 28(4)
[MIGAL, Galilee Technol. Cent., Kiriat Shmona, Israel] This study examined the influence of various stocking densities of elvers (*Anguilla anguilla*) on the ability of the elvers learning to eat artificial food mixed with raw chicken offal. The survival rate of the elvers maintained at 0.3 kg/m^2 was higher by 55% (55% survival, 19% cannibalism and 26% mortality) than the other groups maintained at a density of 0.5 kg/m^2 (40% survival, 28% mortality and 32% cannibalism) and the groups maintained at a density of 1 kg/m^2 (37% survival, 21% mortality and 42% cannibalism). The smallest elvers had been eaten by the others, mostly in the groups in the high density

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

83-002043 CONTINUED containers (1 kg/m^2). The food consumption was highest in the low density container (5.8%/day), and in the high density containers, food consumption was 4.0%/day.

83-002044 Fowler, L. F. EFFECT OF DIETARY PROTEIN AND ENERGY ON GROWTH AND SURVIVAL OF FALL CHINOOK SALMON FRY. *Prog. Fish-Cult.* 45(2):128-129. Apr. 1983. SFA 28(4)
[U.S. FWS, Abernathy Salmon Cult. Dev. Cent., Longview, WA 98632]

83-002045 Higgs, D. A.; U. H. M. Fagerlund; J. R. McBride; M. D. Plotnikoff; B. S. Dosanjh; J. R. Markert and J. Davidson. PROTEIN QUALITY OF ALTEX CANOLA MEAL FOR JUVENILE CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA*) CONSIDERING DIETARY PROTEIN AND 3,5,3'-TRIIODO-L-THYRONINE CONTENT. *Aquaculture* 34(3-4):213-238. Aug. 1983. SFA 28(4)
[Fish. Res. Br., Dep. Fish. Oceans, 4160 Marine Dr., West Vancouver, BC V7V 1N6, Canada]

83-002046 Lemm, C. A. GROWTH AND SURVIVAL OF ATLANTIC SALMON FED SEMIMOIST OR DRY STARTER DIETS. *Prog. Fish-Cult.* 45(2):72-75. Apr. 1983. SFA 28(4)
[U.S. FWS, Natl. Fish. Res. Dev. Lab., Wellsboro, PA 16901]

83-002047 Mgbenka, B. O. INTENSIVE FEEDING OF GRASS CARP, *CTENOPHARYNGODON IDELLA* VAL., IN EARTHEN PONDS. *Ph.D. dissertation, Auburn Univ.* 81p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(1):2. July 1983. SFA 28(4)
The responses of grass carp, stocked intensively (8,000 per hectare) in earthen ponds and grown from 63g to 192g in 84 days, to three pelleted supplemental feeds were evaluated. The feeds were a commercial type catfish feed and feeds in which dehydrated alfalfa meal comprised 19.3% and 38.5% of the formula. The feeds were formulated to be equal in digestible protein and digestible energy, and met all nutritional requirements for channel catfish. Digestive tract contents of grass carp collected during the feeding study were examined to determine how well fish were consuming each of the formulated feeds. Digestibility of crude protein and gross energy in the feeds and the individual feed ingredients was determined with 174-g grass carp at 27.2°C ± 1.4°C by the indirect chromic oxide indicator method. Average weight gains per fish were 80.9, 155.3 and 109.9g and average feed conversions were 2.3, 1.4, and 2.2 for grass carp fed the catfish feed, the low, and the high alfalfa feeds, respectively. The low alfalfa feed improved weight gain and feed conversion slightly but significantly ($P<0.05$). There was no difference in performance between the fish fed the high alfalfa feed and the catfish feed. Digestive tracts of all fish contained large and similar amounts of supplemental feeds; natural pond foods accounted for less than 5% of the ingesta. This indicated that inclusion of alfalfa meal did not influence acceptance of the formulated feeds and that the fish depended on the supplemental feed for most of their nutrient. Digestibility of crude protein and gross energy was satisfactory in all of the feeds for grass carp. Digestion of crude protein and gross energy in soybean meal and fishmeal was comparable to that of other fishes; however, grass carp digested alfalfa meal better and protein in corn poorer than most other warmwater fishes. Results of this study indicate that grass carp stocked intensively in earthen ponds will grow from fingerling to yearling size satisfactorily accept, digest and utilize for growth supplemental feeds made from commonly used feedstuffs and prepared in proper pellet size. Although the fish grew satisfactorily on a commercial type catfish feed, the inclusion of 19.3% alfalfa meal in the formula improved growth slightly. The low digestibility of proetin and energy in corn by grass carp indicated that corn should be used minimally in grass carp feeds.

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

83-002048 Millikin, M. R. QUALITATIVE AND QUANTITATIVE NUTRIENT REQUIREMENTS OF FISHES: A REVIEW. *NOAA Fish. Bull.* 80(4):655-686. Oct. 1982. SFA 28(4)
[NMFS, P.O. Box 12607, Charleston, SC 29412]

83-002049 Papaparaskeva-Papoutsoglou, E.; M. P. Alexis and S. E. Papoutsoglou. STUDIES OF THE EFFECT OF DIETARY INORGANIC SALTS ON GROWTH AND SALINITY TOLERANCE OF JUVENILE RAINBOW TROUT. *Thalassographica* 5(2):81-91. Dec. 1982. In English with Greek summ. SFA 28(4)
[Inst. Oceanogr. Fish Res., Athens, Greece] Five groups of young rainbow trout (initial weight 1g) were fed with different increasing amounts of salt (from 4 to 12%) and their growth, food utilization characteristics and survival after transfering them to increasing salinities examined. Salt supplementation of food did not have an effect on food conversion efficiency except from one case, where the grams of salt ingested with food were 4.1 per kg of fish per day. Net protein utilization was slightly better in fish receiving salty food. Small changes in the body composition were also observed. Addition of salt in the food did not have although any effect on the survival of fish when transfered to seawater.

83-002050 Reinitz, G. EVALUATION OF SODIUM BENTONITE IN PRACTICAL DIETS FOR RAINBOW TROUT. *Prog. Fish-Cult.* 45(2):100-102. Apr. 1983. SFA 28(4)
[U.S. FWS, P.O. Box 158, Spearfish, SD 57783]

83-002051 Reinitz, G. RELATIVE EFFECT OF AGE, DIET, AND FEEDING RATE ON THE BODY COMPOSITION OF YOUNG RAINBOW TROUT (*SALMO GAIRDNERI*). *Aquaculture* 35(1):19-27. Sept. 1983. SFA 28(4)
[U.S. FWS, Diet Testing Dev. Cent. P.O. Box 158, Spearfish, SD 57783] Rainbow trout with an initial weight of 2.1 g were fed two experimental diets at three feeding rates for 308 days, or starved for 140 days. Previous nutritional history (diet and feeding rate) and fish size (individual weight) were observed to be the primary determinants of percent protein, fat, ash, or moisture in the carcasses of nonstarving fish. Age could not be identified as a primary factor in determining body composition. Both protein and fat were catabolized for energy by starving fish but the depletion of body fat was much more rapid and severe. Increasing the rate of feeding increased protein and fat (%) and decreased moisture and ash (%) in fish carcasses. Diet affected the percent of fat and moisture but not protein or ash in fish carcasses. An increase in dietary fat and protein (%) resulted in a decrease in moisture (%) and an increase in fat (%) in fish carcasses.

83-002052 Roley, D. D. THE EFFECT OF DIET PROTEIN LEVEL, FEEDING LEVEL AND REARING WATER TEMPERATURE ON THE GROWTH AND REPRODUCTIVE PERFORMANCE OF RAINBOW TROUT BROODSTOCK. *Ph.D. dissertation, Univ. Wash.* 289p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(4):961. Oct. 1983. SFA 28(4)

83-002053 Santiago, C. B.; M. Bañes-Aldaba and E. T. Songalia. EFFECT OF ARTIFICIAL DIETS ON GROWTH AND SURVIVAL OF MILKFISH FRY IN FRESH WATER. *Aquaculture* 34(3-4):247-252. Aug. 1983. SFA 28(4)
[SEAFDEC, Binangonan, Rizal, Phillipines] Wild milkfish fry (mean weight = 15 mg) were reared in fresh water for 5 weeks using four artificial dry diets, *Moina*, or blended water hyacinth leaves as feed. The fry fed with artificial diets attained 83-95% mean survival rates and 0.16-0.18 g mean weight gains. Those fed with *Moina* and blended water hyacinth leaves had much lower growth and survival. The four dry diets containing 40% crude

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

83-002053 CONTINUED protein appeared adequate for the fry. Substitution of up to 5% crude protein by soybean meal and/or ipil-ipil leaf meal did not affect growth, but diets containing ipil-ipil leaf meal gave slightly lower survival rates.

83-002054 Stickney, R. R.; R. B. McGeachin; D. H. Lewis and J. Marks. RESPONSE OF YOUNG CHANNEL CATFISH TO DIETS CONTAINING PURIFIED FATTY ACIDS. *Trans. Am. Fish. Soc.* 112(5):665-669. Sept. 1983. SFA 28(4)
[Dep. Wildl. Fish. Sci., Tex. A & M Univ., College Station 77843]

83-002055 Takeuchi, T.; S. Satoh and T. Watanabe. [REQUIREMENT OF *TILAPIA NILOTICA* FOR ESSENTIAL FATTY ACIDS.] *Bull. Jpn. Soc. Sci. Fish.* 49(7):1127-1134. July 1983. In Japanese with English summ. SFA 28(4)
[Lab. Fish. Nutr., Tokyo Univ. Fish., Konan-4, Minato, Tokyo 108, Japan]

83-002056 Taniguchi, M. [FEEDING EXPERIMENT OF YELLOWTAIL USING FROZEN DIET.] *Bull. Jpn. Soc. Sci. Fish.* 49(4):611-615. Apr. 1983. In Japanese with English summ. SFA 28(4)
[Kochi Pref. Freshwater Fish. Lab., Tosayamada, Kochi 782, Japan]

83-002057 Viola, S. and Y. Arieli. NUTRITION STUDIES WITH TILAPIA HYBRIDS. 2. THE EFFECTS OF OIL SUPPLEMENTS TO PRACTICAL DIETS FOR INTENSIVE AQUACULTURE. *Bamidgeh* 35(2):44-52. June 1983. SFA 28(4)
[Miloubar, D.N. Ashrat 25201, Israel]

83-002058 Viola, S. and Y. Arieli. EVALUATION OF DIFFERENT GRAINS AS BASIC INGREDIENTS IN COMPLETE FEEDS FOR CARP AND TILAPIA IN INTENSIVE CULTURE. *Bamidgeh* 35(2):38-43. June 1983. SFA 28(4)
[Miloubar, D.N. Ashrat 25201, Israel] Corn, milo, wheat, wheat bran and barley were compared in four cage-trials as basic ingredients in feeds for carp and tilapia of 120-250 g. All test diets contained 25% crude protein. The bran was mixed with corn in a ratio of 1:1. With carp only barley reduced the rate of growth significantly. With tilapia sorghum or bran mixed with corn gave the best results, while corn alone reduced the rate of growth significantly in each trial. The differences in feed utilization between the two species and their implications for commercial feed formulation are discussed.

83-002059 Watanabe, T.; H. Nanri; S. Satoh; M. Takeuchi and T. Nose. NUTRITIONAL EVALUATION OF BROWN MEALS AS A PROTEIN SOURCE IN DIETS FOR RAINBOW TROUT. *Bull. Jpn. Soc. Sci. Fish.* 49(7):1083-1087. July 1983. SFA 28(4)
[Lab. Fish. Nutr., Tokyo Univ. Fish., Konan 4, Minato, Tokyo 108, Japan]

83-002060 Woodward, B.; L. G. Young and A. K. Lun. VOMITOXIN IN DIETS FOR RAINBOW TROUT (*SALMO GAIRDNERI*). *Aquaculture* 35(2):93-101. Oct. 1983. SFA 28(4)
[Dep. Nutr., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

TRANSPORTING FISH

83-002061 Carmichael, G. J.; G. A. Wedemeyer; J. P. McCraren and J. L. Millard. PHYSIOLOGICAL EFFECTS OF HANDLING AND HAULING STRESS ON SMALLMOUTH BASS. *Prog. Fish-Cult.* 45(2):110-113. Apr. 1983. SFA 28(4)

TRANSPORTING FISH (CONTINUED)

83-002061 CONTINUED
[San Marcos Natl. Fish Hatchery Dev. Cent., U.S. FWS, Rt. 1, Box 159-D, San Marcos, TX 78666]

83-002062 Jones, R. T.; E. A. Hudson and J. C. Andrews. METHODS FOR TRANSPORT AND LONG-TERM MAINTENANCE OF SPINY DOGFISH SHARKS. *Lab. Anim. Sci.* 33(4):388-389. Aug. 1983. SFA 28(4)
[Exp. Pathol. Lab., NCI-FCRF, Bldg. 560, Rm. 32-60 Frederick, MD 21701] Spiny dogfish shark (*Squalus acanthias*) embryos were transported from Maine to the Maryland laboratory where they were maintained for 20 months. During this maintenance period, these sharks progressed from a yolk-sac stage to feeding stage. Animals were maintained at 10°C in artificial seawater containing penicillin and streptomycin and were fed frozen brine shrimp and krill. The ease with which these animals could be maintained in the laboratory for an extended period of time greatly enhanced their usefulness as an experimental animal in a variety of studies.

83-002063 Takeda, T. and Y. Itazawa. [POSSIBILITY OF APPLYING ANESTHESIA BY CARBON DIOXIDE IN THE TRANSPORTATION OF LIVE FISH.] *Bull. Jpn. Soc. Sci. Fish.* 49(5):725-731. May 1983. In Japanese with English summ. SFA 28(4)
[Dep. Fish., Fac. Agric., Kyushu Univ., Hakozaki, Higashi-ku, Fukuoka 812, Japan] Three different methods to induce either anesthesia or sedation were examined for the purpose of applying to transport of live fish. Two of them, production of carbon dioxide by adding sodium bicarbonate and sulphuric acid to water, and bubbling carbon dioxide and oxygen into water for a short duration until the fish were anesthetized, were simple and cheap ways but were found to be unsuitable in the case of live transport, because these methods were applicable only in cases of very low density of fish. The third method, bubbling carbon dioxide and oxygen into water throughout the course of transport, was safe for carp when P_{CO_2} and P_{O_2} in water were kept at 95-115 mmHg and 400-480 mmHg, respectively, but is considered to be impractical because of the laboriousness and high cost in maintaining P_{CO_2} and P_{O_2} at their optimum levels. And this method was found to be inapplicable for porgies, because safe P_{CO_2} was not effective and effective P_{CO_2} was not safe.

AQUARIUMS

83-002064 Cooley, P. E. BIOLOGICAL FILTRATION. *Am. Assoc. Zool. Parks Aquariums Reg. Conf. Proc.* 1983:42-57. 1983. SFA 28(4)
[James M. Montgomery, Consulting Engineers, Inc., La Jolla, CA]

83-002065 Fausch, K. D. and R. J. White. SINUOUS STREAM AQUARIUM TO SIMULATE LOTIC FISH HABITAT. *Prog. Fish-Cult.* 45(2):113-116. Apr. 1983. SFA 28(4)
[Dep. Fish. Wildl. Biol., Colo. State Univ., Fort Collins 80523]

83-002066 Mottice, R. J. SPECIAL SUPPLEMENTAL FILTRATION TECHNIQUES FOR AQUATIC SYSTEMS. *Am. Assoc. Zool. Parks Aquariums Reg. Conf. Proc.* 1983:154-163. 1983. SFA 28(4)

83-002067 Newman, M. A. SEQUENTIAL PRESENTATION OF PACIFIC COAST AQUATIC HABITATS AS AN EXHIBIT TECHNIQUE. *Am. Assoc. Zool. Parks Aquariums Reg. Conf. Proc.* 1983:6-8. 1983. SFA 28(4)
[Vancouver Aquarium, Vancouver, BC, Canada]

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT

83-002068 Anonymous. WASTE-HEAT AQUACULTURE AT TVA'S GALLATIN STEAM PLANT. *Aquacult. Mag.* 9(6):13-15. Sept.-Oct. 1983. SFA 28(4)
[Waste Heat Aquacult. Facility, Gallatin Steam Plant, Gallatin, TN 37066]

83-002069 Fuss, J. T. EVALUATION OF A HEAT PUMP FOR AN AQUACULTURAL APPLICATION. *Prog. Fish-Cult.* 45(2):121-123. Apr. 1983. SFA 28(4)
[U.S. FWS, Natl. Fish. Res. Dev. Lab., R.D. #4, Box 63, Wellsboro, PA 16901]

83-002070 Marking, L. L.; V. K. Dawson and J. R. Crowther. COMPARISON OF COLUMN AERATORS AND A VACUUM DEGASSER FOR TREATING SUPERSATURATED CULTURE WATER. *Prog. Fish-Cult.* 45(2):81-83. Apr. 1983. SFA 28(4)
[U.S. FWS, Natl. Fish. Res. Lab., P.O. Box 818, La Crosse, WI 54601]

GENERAL LIMNOLOGY AND OCEANOGRAPHY

83-002071 Canfield, D. E., Jr.; K. A. Langeland; M. J. Maceina; W. T. Haller and J. V. Shireman. TROPHIC STATE CLASSIFICATION OF LAKES WITH AQUATIC MACROPHYTES. *Can. J. Fish. Aquatic Sci.* 40(10):1713-1718. Oct. 1983. In English with French summ. SFA 28(4)
[Cent. Aquatic Weeds, Univ. Fla., Gainesville 32611]

83-002072 Lillie, R. A. and J. W. Mason. LIMNOLOGICAL CHARACTERISTICS OF WISCONSIN LAKES. *Wis. Dep. Nat. Resour. Tech. Bull.* No. 138. 116p. 1983. SFA 28(4)
[Wis. Dep. Nat. Resour., 3911 Fish Hatchery Rd., Madison 53711]

83-002073 Sutcliffe, W. H., Jr.; R. H. Loucks; K. F. Drinkwater and A. R. Coote. NUTRIENT FLUX ONTO THE LABRADOR SHELF FROM HUDSON STRAIT AND ITS BIOLOGICAL CONSEQUENCES. *Can. J. Fish. Aquatic Sci.* 40(10):1692-1701. Oct. 1983. In English with French summ. SFA 28(4)
[Box 187 B, Rt. 4, Bakersville, NC 28705]

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83-002074 Hudson, P. L. and J. L. Oliver. PORTABLE SUCTION SAMPLER FOR QUANTITATIVELY SAMPLING MACROINVERTEBRATES AND PERIPHYTON ON BEDROCK. *Prog. Fish-Cult.* 45(2):123-124. Apr. 1983. SFA 28(4)
[U.S. FWS, Great Lakes Fish. Lab., 1451 Green Rd., Ann Arbor, MI 48105]

83-002075 Wildish, D. J.; D. L. Peer; A. J. Wilson; J. Hines; L. Linkletter and M. J. Dadswell. SUBLITTORAL MACRO-INFAUNA OF THE UPPER BAY OF FUNDY. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1194. iii + 64p. June 1983. In English with French summ. SFA 28(4)
[Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

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83-002076 Almaça, C. IBERIAN AND MEDITERRANEAN ELEMENTS IN THE IBERIAN FAUNA OF *BARBUS* (PISCES: CYPRINIDAE). *Senckenb. Biol.* 63(5-6):329-332. 20 July 1983. In English with German and Portugese summ. SFA 28(4)
[Mus. Bocage, Fac. Ciênc., Rua de Escola Politéc., P-1294, Lisboa Codex, Portugal]

83-002077 Arratia, G. THE CAUDAL SKELETON OF OSTARIOPHYSAN FISHES (TELEOSTEI): INTRASPECIFIC VARIATION IN TRICHOMYCTERIDAE (SILURIFORMES). *J. Morphol.* 177(2):213-229. Aug. 1983. SFA 28(4)
[Mus. Nat. Hist., Univ. Kans., Lawrence 66045]

83-002078 Billard, R. SPERMIOGENESIS IN THE RAINBOW TROUT (*SALMO GAIRDNERI*). AN ULTRASTRUCTURAL STUDY. *Cell Tissue Res.* 233(2):265-284. Aug. 1983. SFA 28(4)
[I.N.R.A., Lab. Physiol. Poissons, Rennes, France]

83-002079 Branson, B. A. OBSERVATIONS ON THE PALEZONE AND SAWFIN SHINERS, TWO UNDESCRIBED CYPRINID FISHES FROM KENTUCKY. *Trans. Ky. Acad. Sci.* 44(3-4):103-106. Sept. 1983. SFA 28(4)
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83-002144 Crim, L. W. and D. M. Evans. INFLUENCE OF TESTOSTERONE AND/OR LUTEINIZING HORMONE RELEASING HORMONE ANALOGUE ON PRECOCIOUS SEXUAL DEVELOPMENT IN THE JUVENILE RAINBOW TROUT. *Biol. Reprod.* 29(1):137-142. Aug. 1983. SFA 28(4)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

83-002145 Crocker, P. A.; C. R. Arnold; J. A. DeBoer and G. J. Holt. BLOOD OSMOLALITY SHIFT IN JUVENILE RED DRUM, *SCIAENOPS OCELLATUS* L. EXPOSED TO FRESH WATER. *J. Fish Biol.* 23(3):315-319. Sept. 1983. SFA 28(4)
[701 Missy Lane, Irving, TX 75060] Juvenile red drum, *Sciaenops ocellatus*, measuring 40-49 mm S.L. tolerated abrupt transfer from

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83-002145 CONTINUED 28^{o}/oo salinity sea water to fresh water ($<1^{o}$/oo). A significant shift in blood osmolality from a level of about 350 mosmol l^{-1} in sea water to a new level of about 311 mosmol l^{-1} was experienced by fish after 48 h in fresh water. The shift was followed by a slight reduction in blood osmolality to a sustained level of 300 mosmal l^{-1} after 96 h exposure to fresh water. The overall effect of increased environmental calcium on blood osmotic pressure of young red drum was not significant at the level tested.

83-002146 Dabrowski, K. R. PROCES ROZRODU RYB W ASPEKCIE ZMIAN CHEMICZNYCH I BIOCHEMICZ-NYCH CIALA ZE SZCZEGÓLNYM UWZGLEDNIENIEM RYB GLABIELOWATYCH.] [CHEMICAL AND BIOCHEMICAL ASPECTS IN REPRODUCTION STRATEGY OF FISH WITH PARTICULAR ATTENTION TO COREGONIDS.] *Zesk. Nauk. Akad. Roln. Tech. Olsz.* 12:137-155. 1983. In Polish with English and Russian summ. SFA 28(4)

83-002147 Dabrowski, K. R. A NOTE ON THE ENERGY TRANSFORMATION IN BODY AND GONAD OF COREGONID FISH. *Arch. Hydrobiol.* 97(3):406-414. 1983. SFA 28(4)
[Inst. Ichthyol. Fish, Acad. Agric. Technol., 10-957 Olsztyn 5, Kortowo, Poland]

83-002148 Dashow, L. and A. Epple. EFFECTS OF EXOGENOUS CATECHOLAMINES ON PLASMA CATECHOLAMINES AND GLUCOSE IN THE SEA LAMPREY, *PETROMYZON MARINUS*. *J. Comp. Physiol. B Biochem. Syst. Environ. Physiol.* 152(1):35-41. July 1983. SFA 28(4)
[Daniel Baugh Inst. Anat., Jefferson Med. Coll., Thomas Jefferson Univ., 1020 Locust St., Philadelphia, PA 19107]

83-002149 Davenport, J. OXYGEN AND THE DEVELOPING EGGS AND LARVAE OF THE LUMPFISH, *CYCLOPTERUS LUMPUS*. *J. Mar. Biol. Assoc. U.K.* 63(3):633-640. Aug. 1983. SFA 28(4)
[N.E.R.C. Unit Mar. Invert. Biol., Mar. Sci. Lab., Menai Bridge, Gwynedd, LL59 5EH, Wales] Unfertilized eggs in the oviducts of female lumpsuckers are exposed to low oxygen tension (*ca.* 40% air saturation). After spawning and fertilization water agitation aids percolation of water through *Cyclopterus* egg masses, but early in development oxygen tensions within non-ventilated egg masses fall slowly because of the eggs' low metabolic rate (consistent with their slow development - 40 days to hatching at 5°C). There is a considerable increase in oxygen uptake at hatching; in this respect the lumpsucker resembles the herring, *Clupea harengus*. Early stage eggs are tolerant of hypoxic conditions and can even survive brief exposure to anoxic sea water. Later eggs and larvae are much more susceptible to oxygen lack. However, fanning behaviour by the brooding male parent (usually assumed to promote oxygen uptake by egg masses) is almost continuous at the beginning of development but becomes less frequent later. It is suggested that the initial intensive fanning helps to drive off ammonia which is released as the eggs stick together.

83-002150 Davenport, J.; S. Lønning and E. Kjørsvik. AMMONIA OUTPUT BY EGGS AND LARVAE OF THE LUMPSUCKER, *CYCLOPTERUS LUMPUS*, THE COD, *GADUS MORHUA* AND THE PLAICE, *PLEURONECTES PLATESSA*. *J. Mar. Biol. Assoc. U.K.* 63(3):713-723. Aug. 1983. SFA 28(4)
[N.E.R.C. Unit Mar. Invert. Biol., Mar. Sci. Lab., Menai Bridge, Gwyneed, LL59 5EH, Wales] Cod and plaice eggs show a gradually increasing rate of

PHYSIOLOGY (CONTINUED)

83-002150 CONTINUED ammonia excretion during development and in neither species was there a great change in individual output at hatching. The rates of ammonia excretion recorded for cod and plaice larvae were similar to those recorded for planktonic crustacea of comparable size by Conover & Corner (1968). Lumpsucker eggs and larvae have a basically low rate of ammonia excretion (consistent with their slow rate of development and low oxygen consumption), but much ammonia was released from the eggs in the first day or two after spawning. This ammonia was of non-metabolic origin, but was not accumulated from the ovarian fluid prior to spawning. Lumpfish eggs become very sticky when they are first exposed to sea water, but this stickiness is lost within 24h. Stickiness stems from a viscous elastic slime; it is suggested that the non-metabolic output of ammonia is caused by changes in the composition of the slime as the eggs are bound together in a lattice.

83-002151 Davison, W. CHANGES IN MUSCLE CELL ULTRASTRUCTURE FOLLOWING EXERCISE IN *SALMO TRUTTA*. *Experientia (Basel)* 39(9):1017-1018. 15 Sept. 1983. SFA 28(4)
[Dep. Zool., Univ. Canterbury, Christchurch, New Zealand] One month of swimming at low speed produced very little change in the composition of red and white muscle fibers of the brown trout. This indicates that fish are unable to compensate for increased exercise levels by increasing the aerobic capacity of the muscle cells.

83-002152 Day, J. R. and M. H. Taylor. ENVIRONMENTAL CONTROL OF THE ANNUAL GONADAL CYCLE OF *FUNDULUS HETEROCLITUS* L.: THE PINEAL ORGAN AND EYES. *J. Exp. Zool.* 227(3):453-458. Sept. 1983. SFA 28(4)
[M. H. Taylor: Sch. Life Health Sci., Univ. Del., Newark 19711]

83-002153 De Silva, S. S. and A. A. Owoyemi. EFFECT OF DIETARY QUALITY ON THE GASTRIC EVACUATION AND INTESTINAL PASSAGE IN *SAROTHERODON MOSSAMBICUS* (PETERS) FRY. *J. Fish Biol.* 23(3):347-355. Sept. 1983. SFA 28(4)
[Dep. Zool., Ruhuna Univ. Coll., Matara, Sri Lanka] The gastric evacuation time (GET) and the passage of food through the intestines was investigated in *Sarotherodon mossambicus* (Peters) fry of two size groups, viz. 0.2-1.0 g and 1.0-3.0 g, in response to five diets. In the experiments voluntary feeding was adopted and markers were not used. The passage of food through the stomach was described by the exponential model. The GET increased with body weight for any particular diet, with one exception. The GET ranged from 290 min to 1104 min in fry of 1.0-3.0 g on Diet 2. There was evidence to indicate that the GET was negatively correlated to the specific gravity of the diet. The passage of food through the intestines showed a consistent trend from diet to diet; e.g. the algal diet being moved into the intestine in 'finite' quanta as opposed to the others. The importance of these observations and the implications of the dependence of the GET on the specific gravity of the diet in the use of markers in digestibility studies are discussed.

83-002154 Del Tito, B. J., Jr. ROLE OF BETA-CAROTENE AND LUTEIN IN THE SYNTHESIS OF VITAMIN A IN GOLDFISH. *Prog. Fish-Cult.* 45(2):94-97. Apr. 1983. SFA 28(4)
[VA Med. Cent., Res. Dep. K-210, 10701 East Blvd., Cleveland, OH 44106]

83-002155 DiBattista, J. A.; A. Z. Mehdi and T. Sandor. INTESTINAL TRIAMCINOLONE ACETONIDE RECEPTORS OF THE EEL *(ANGUILLA ROSTRATA)*. *Gen. Comp. Endocrinol.* 51(2):228-238. Aug. 1983. SFA 28(4)
[Lab. Endocrinol., Hosp. Notre-Dame, Montreal, PQ, Canada]

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83-002156 Driedzic, W. R. THE FISH HEART AS A MODEL SYSTEM FOR THE STUDY OF MYOGLOBIN. *Comp. Biochem. Physiol. A Comp. Physiol.* 76(3):487-493. 1983. SFA 28(4)
[Biol. Dep., Mount Allison Univ., Sackville, NB E0A 3C0, Canada]

83-002157 El Hakeem, O. H. and M. M. Babiker. BIOASSAY OF INSULIN ACTIVITY OF PANCREATIC TISSUE IN ACTIVE AND AESTIVATED AFRICAN LUNGFISH, *PROTOPTERUS ANNECTENS* (OWEN). *J. Fish Biol.* 23(3):277-282. Sept. 1983. SFA 28(4)
[Dep Zool., Univ. Khartoum, Sudan]

83-002158 Eldridge, M. B.; J. A. Whipple and M. J. Bowers. BIOENERGETICS AND GROWTH OF STRIPED BASS, *MORONE SAXATILIS*, EMBRYOS AND LARVAE. *NOAA Fish. Bull.* 80(3):461-474. July 1982. SFA 28(4)
[NMFS, Tiburon, CA 94920] Fluctuations in year class size of striped bass are known to be related to development and survival in the early life stages. Bioenergetic aspects of growth and development of striped bass embryos and larvae were determined in the laboratory to discover some of the physiological needs and processes of these stages from fertilization to metamorphosis. Energy was provided by endogenous (yolk and oil globule) and exogenous (*Artemia* sp.) sources. Initial amounts of yolk and oil varied significantly among eggs from seven different females, and these differences reflected in different patterns of consumption and growth. Feeding larvae consumed their endogenous oil at rates related to exogenous food intake. Daily food rations of larvae from the onset of feeding to metamorphosis were estimated for field and laboratory conditions. Rations increased with size and age of the larvae. Wild larvae were estimated to have daily rations substantially greater than those of cultured larvae. Energy outputs were measured in growth and oxygen consumption. Egg size (total dry weight) directly influenced early periods of growth, but later compensatory growth, seen in more rapid growth in larvae from smaller eggs, made up for initial differences. Growth and food consumption were linearly related and, again, different growth characteristics were seen in each batch of fish. Embryos and prefeeding larvae had the highest Q_{O_2}, while metabolism on a weight-specific basis increased with tissue dry weight and was best described by a power function. Gross caloric conversion efficiencies were highest from fertilization to initial feeding. Feeding larvae used their resources at levels under 20% and their conversion efficiences did not appear to correlate with food concentration. In an energy budget model, striped bass embryos and larvae given the highest food density consumed yolk energy at constant rates until totally absorbed. Oil globule consumption fluctuated in relation to growth and nonassimilation, rising sharply after the first feeding then declining as food intake increased. Metabolism fluctuated according to developmental stage, rising with the onset of active feeding. Nonassimilation steadily increased as larvae relied more on exogenous food.

83-002159 Elger, B. and H. Hentschel. EFFECT OF ADRENERGIC BLOCKADE WITH BRETYLIUM AND PHENTOLAMINE ON GLOMERULAR FILTRATION RATE IN THE RAINBOW TROUT, *SALMO GAIRDNERI* RICH., ADAPTING TO SALINE WATER. *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 75(2):253-258. 1983. SFA 28(4)
[Zent. Innere Med. Dermatol., Med. Hochsch., D-3000 Hannover 61, West Germany]

83-002160 Ellis, A. G. and D. G. Smith. EDEMA FORMATION AND IMPAIRED O_2 TRANSFER IN RINGER-PERFUSED GILLS OF THE EEL, *ANGUILLA AUSTRALIS*. *J. Exp. Zool.* 227(3):371-380. Sept. 1983. SFA 28(4)
[Dep. Zool., Univ. Melbourne, Parkville, Victoria, 3052, Australia]

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83-002161 Evans, D. H. and J. B. Claiborne. HAEMODYNAMIC EFFECTS OF ADRENALINE ON THE ISLOLATED, PERFUSED HEAD OF THE DOGFISH 'PUP' (*SQUALUS ACANTHIAS*). *J. Exp. Biol.* 105:363-371. July 1983. SFA 28(4)
[Dep. Zool., Univ. Fla., Gainesville 32611]

83-002162 Faulmann, E.; M. A. Cuchens; C. J. Lobb; N. W. Miller and L. W. Clem. AN EFFECTIVE CULTURE SYSTEM FOR STUDYING IN VITRO MITOGENIC RESPONSES OF CHANNEL CATFISH LYMPHOCYTES. *Trans. Am. Fish. Soc.* 112(5):673-679. Sept. 1983. SFA 28(4)
[Dep. Microbiol., Univ. Miss. Med. Cent., 2500 North State St., Jackson 39216]

83-002163 Ferraris, R. P. and G. A. Ahearn. INTESTINAL GLUCOSE TRANSPORT IN CARNIVOROUS AND HERBIVOROUS MARINE FISHES. *J. Comp. Physiol. B Biochem. Syst. Environ. Physiol.* 152(1):79-90. July 1983. SFA 28(4)
[G. A. Ahearn: Dep. Zool., 2538 The Mall, Univ. Hawaii at Manoa, Honolulu, 96822]

83-002164 Flerova, G. I. INTRASPECIFIC AND INTERSPECIFIC DIFFERENCES IN THE CATION COMPOSITION OF BLOOD PLASMA AND ERYTHROCYTES OF SOME FRESHWATER FISHES. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(1):115-123. 1983. SFA 28(4)
[Inst. Biol. Inland Waters, Acad. Sci. USSR, Borok, Yaroslavl Dist., USSR]

83-002165 Forstner, H.; S. Hinterleitner; K. Mähr and W. Wieser. TOWARDS A BETTER DEFINITION OF "METAMORPHOSIS" IN *COREGONUS* SP.: BIOCHEMICAL, HISTOLOGICAL, AND PHYSIOLOGICAL DATA. *Can. J. Fish. Aquatic Sci.* 40(8):1224-1232. Aug. 1983. In English with French summ. SFA 28(4)
[Inst. Zoophysiol., Univ. Innsbruck, Peter-Mayr-Strasse, A6020 Innsbruck, Austria]

83-002166 Foureman, G. L.; N. B. White, Jr. and J. R. Bend. BIOCHEMICAL EVIDENCE THAT WINTER FLOUNDER (*PSEUDOPLEURONECTES AMERICANUS*) HAVE INDUCED HEPATIC CYTOCHROME P-450-DEPENDENT MONOOXYGENASE ACTIVITIES. *Can. J. Fish. Aquatic Sci.* 40(7):854-865. July 1983. In English with French summ. SFA 28(4)
[Lab. Pharmacol., Natl. Inst. Health, P.O. Box 12233, Research Triangle Park, NC 27709]

83-002167 Frankel, J. S. LACTATE DEHYDROGENASE TISSUE SPECIFICITY AND CHARACTERIZATION IN THE TELEOST GENUS *BARBUS*. *Comp. Biochem. Physiol. B Comp. Biochem.* 76(1):103-105. 1983. SFA 28(4)
[Dep. Zool., Howard Univ., Washington, DC 20059]

83-002168 Gibson, R. J. LARGE ATLANTIC SALMON PARR (*SALMO SALAR*) OF A BOREAL RIVER IN QUÉBEC. *Nat. Can. (Que.)* 110(2):135-141. 1983. In English with French summ. SFA 28(4)
[Dep. Fish. Oceans, P.O. Box 5667, St. John's, NF A1C 5X1, Canada] Large Atlantic salmon parr (*Salmo salar* L.) occur in the Matamec River, north shore of the Gulf of St. Lawrence (Québec), larger than the size at which parr would normally become smolt. A sample of 23 parr was taken in the autumn of 1975, ranging in fork length between 16.5 cm and 22.5 cm. One was an immature female and the remainder were precocious males. The youngest (2+)

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83-002168 CONTINUED and fastest growing were in richer feeding areas upstream, below a lake, and the oldest (5+ and 6+), and slower growing, were collected farther downstream. These large "dwarf males" appear to be a feature of salmon in northern rivers. The adaptive value of this form in the life cycle is discussed.

83-002169 Gold, M. R. and A. R. Martin. ANALYSIS OF GLYCINE-ACTIVATED INHIBITORY POST-SYNAPTIC CHANNELS IN BRAIN-STEM NEURONES OF THE LAMPREY. *J. Physiol. (Lond.)* 342:99-117. Sept. 1983. SFA 28(4)
[Dep. Physiol., Sch. Med., Univ. Colo. Health Sci. Cent., Denver 80262]

83-002170 Goolish, E. M. and I. R. Adelman. EFFECTS OF FISH GROWTH RATE, ACCLIMATION TEMPERATURE AND INCUBATION TEMPERATURE ON *IN VITRO* GLYCINE UPTAKE BY FISH SCALES. *Comp. Biochem. Physiol. A Comp. Physiol.* 76(1):127-134. 1983. SFA 28(4)
[Dep. Entomol. Fish. Wildl., Univ. Minn., St. Paul 55108]

83-002171 Gorbman, A. EARLY DEVELOPMENT OF THE HAGFISH PITUITARY GLAND: EVIDENCE FOR THE ENDODERMAL ORIGIN OF THE ADENOHYPOPHYSIS. *Am. Zool.* 23(3):639-654. 1983. SFA 28(4)
[Dep. Zool., Univ. Wash., Seattle 98195]

83-002172 Gordon, R. and S. Levina. METHIONINE ENKEPHALIN-INDUCED CHANGES IN PIGMENTATION OF ZEBRAFISH (CYPRINIDAE, *BRACHYDANIO RERIO*) AND RELATED SPECIES AND VARIETIES, MEASURED VIDEODENSITOMETRICALLY. II. PEARL AND GOLD DANIOS. *Gen. Comp. Endocrinol.* 51(3):378-383. Sept. 1983. SFA 28(4)
[Dep. Pathol., Med. Fac., Univ. Manitoba, Winnipeg R3E 0W3, Canada]

83-002173 Grout, D. E. A CASE OF HERMAPHRODITISM IN THE RAINBOW SMELT, *OSMERUS MORDAX*. *Copeia* 1983(3):812-813. 1983. SFA 28(4)
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83-002174 Gustafson-Marjanen, K. I. and H. B. Dowse. SEASONAL AND DIEL PATTERNS OF EMERGENCE FROM THE REDD OF ATLANTIC SALMON (*SALMO SALAR*) FRY. *Can. J. Fish. Aquatic Sci.* 40(6):813-817. June 1983. In English with French summ. SFA 28(4)
[H.B. Dowse: Dep. Zool., Univ. Me., Orono 04469]

83-002175 Hanke, W. and P. A. Janssens. THE ROLE OF HORMONES IN REGULATION OF CARBOHYDRATE METABOLISM IN THE AUSTRALIAN LUNGFISH *NEOCERATODUS FORSTERI*. *Gen. Comp. Endocrinol.* 51(3):364-369. Sept. 1983. SFA 28(4)
[Zool. Inst., Univ. Karlsruhe 1, West Germany]

83-002176 Hansen, H. J. M. and S. Abraham. INFLUENCE OF TEMPERATURE, ENVIRONMENTAL SALINITY AND FASTING ON THE PATTERNS OF FATTY ACIDS SYNTHESIZED BY GILLS AND LIVER OF THE EUROPEAN EEL (*ANGUILLA ANGUILLA*). *Comp. Biochem. Physiol. B. Comp. Biochem.* 75(4):581-587. 1983. SFA 28(4)
[Risø Natl. Lab., 4000 Roskilde, Denmark]

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83-002177 Hara, A.; K. Takano and H. Hirai. IMMUNOCHEMICAL IDENTIFICATION OF FEMALE-SPECIFIC SERUM PROTEIN, VITELLOGENIN, IN THE MEDAKA, *ORYZIAS LATIPES* (TELEOSTS). *Comp. Biochem. Physiol. A Comp. Physiol.* 76(1):135-141. 1983. SFA 28(4)
[Dep. Biochem., Hokkaido Univ. Sch. Med., Sapporo, Hokkaido, Japan]

83-002178 Hasegawa, S.; T. Hirano; N. Kuniya; Y. Abe and K. Suzuki. SEAWATER ADAPTABILITY OF ANADROMOUS AND LANDLOCKED FORMS OF THE AYU *PLECOGLOSSUS ALTIVELIS*. *Bull. Jpn. Soc. Sci. Fish.* 49(4):569-575. Apr. 1983. SFA 28(4)
[Ocean Res. Inst., Univ. Tokyo, Nakano, Tokyo 164, Japan]

83-002179 Hayashi, K.; T. Takagi and M. Kitagawa. COMPOSITIONS OF ETHER-LINKED LIPIDS IN LIVERS OF TWO SPECIES OF RATFISH. *Bull. Jpn. Soc. Sci. Fish.* 49(5):777-782. May 1983. SFA 28(4)
[Fac. Fish., Hokkaido Univ., Hakodate 041, Japan]

83-002180 Hazel, J. R. THE INCORPORATION OF UNSATURATED FATTY ACIDS OF THE n-9, n-6, AND n-3 FAMILIES INTO INDIVIDUAL PHOSPHOLIPIDS BY ISOLATED HEPATOCYTES OF THERMALLY-ACCLIMATED RAINBOW TROUT, *SALMO GAIRDNERI*. *J. Exp. Zool.* 227(2):167-176. Aug. 1983. SFA 28(4)
[Dep. Zool., Ariz. State Univ., Tempe 85287]

83-002181 Hipkins, S. F. and D. G. Smith. CARDIOVASCULAR EVENTS ASSOCIATED WITH SPONTANEOUS APNEA IN THE AUSTRALIAN SHORT-FINNED EEL, *ANGUILLA AUSTRALIS*. *J. Exp. Zool.* 227(3):339-348. Sept. 1983. SFA 28(4)
[Dep. Zool., Univ. Melbourne, Parkville, Victoria, 3052, Australia]

83-002182 Hjelmeland, K.; M. Christie and J. Raa. SKIN MUCUS PROTEASE FROM RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON, AND ITS BIOLOGICAL SIGNIFICANCE. *J. Fish Biol.* 23(1):13-22. July 1983. SFA 28(4)
[Inst. Fish., Univ. Tromsø, N-9000 Tromsø, Norway]

83-002183 Hogendoorn, H. GROWTH AND PRODUCTION OF THE AFRICAN CATFISH, *CLARIAS LAZERA* (C. & V.) III. BIOENERGETIC RELATIONS OF BODY WEIGHT AND FEEDING LEVEL. *Aquaculture* 35(1):1-17. Sept. 1983. SFA 28(4)
[Organ. Improvement Inland Fish., P.O. Box 433, Nieuwegein, Netherlands]
Bioenergetic relations of body weight and feeding level in *C. lazera* were studied in open circuit balance respirometers to elucidate the physiological background of the highly efficient feed conversion in this fish. It was found that changes in proximate body composition that occurred at different feeding levels were largely attributable to concurrent changes in weight. The various body components were allometrically related to body weight. The same was true for the daily oxygen consumption where the weight exponent equalled 0.86 ±0.02 (S.E.) for fasting fish and 0.75± 0.01 (S.E.) for feeding fish. The primary effect of feeding level was in the overall level of metabolism, which increased more than 3-fold from fasting to satiation feeding. The metabolic "scope for growth" was $0.346 \cdot W^{0.75} - 0.145 \cdot W^{0.83}$ (kJ/day). The metabolizability of the feed energy was about 70% decreasing with the feeding level. ME utilization for energy gain above maintenance was 80% efficient, independent of body weight and feeding level. The intake of ME for gain was calculated to decrease from 6.9 to 2.8 times the maintenance requirement for fish of 1 to 200 g. This high ME_p/ME_m ratio largely explains *C. lazera's* efficient utilization of the feed for growth.

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83-002184 Holder, F.; B. Vincent; M. Ristori and P. Laurent. PERFUSION VASCULAIRE D'UN SEGMENT INTESTINAL CHEZ LE POISSON-CHAT (*ICTALURUS MÉLAS*, R.): DÈMONSTRATION DES EFFETS VASOACTIFS DU VIP DE MAMMIFÈRE ET D'EXTRAITS DE TRACTUS GASTRO-INTESTINAL DE POISSON TÉLÉOSTÉEN. [VASCULAR PERFUSION OF AN INTESTINAL LOOP IN THE CATFISH (*ICTALURUS MELAS*, R): DEMONSTRATION OF THE BASOACTIVE EFFECTS OF THE MAMMALIAN VIP AND OF GASTROINTESTINAL EXTRACTS FROM TELEOST FISH.] *C.R. Hebd. Seánces Acad. Sci. Sér. III Sci. Vie* 296(16):783-788. 2 May 1983. In French with English summ. SFA 28(4)
[Lab. Physiol. Comp. Regul., B.P. 20 CR, 67037 Strasbourg Cedex, France]

83-002185 Hutchinson, P. A NOTE RECORDING THE OCCURRENCE OF HERMAPHRODITIC SMELT, *OSMERUS EPERLANUS* (L.) FROM THE RIVER THAMES, ENGLAND. *J. Fish Biol.* 23(2):241-243. Aug. 1983. SFA 28(4)
[Dep. For. Nat. Resour., Univ. Edinburgh, King's Bldg., Mayfield Rd., Edinburgh EH9 3JU, Scotland]

83-002186 Ichii, T. and Y. Mugiya. COMPARATIVE ASPECTS OF CALCIUM DYNAMICS IN CALCIFIED TISSUES IN THE GOLDFISH *CARASSIUS AURATUS*. *Bull. Jpn. Soc. Sci. Fish.* 49(7):1039-1044. July 1983. SFA 28(4)
[Fac. Fish., Hokkaido Univ., Minato-3, Hakodate 041, Japan]

83-002187 Inui, Y. and H. Ishioka. EFFECTS OF INSULIN AND GLUCAGON ON THE INCORPORATION OF [^{14}C] GLYCINE INTO THE PROTEIN OF THE LIVER AND OPERCULAR MUSCLE OF THE EEL *IN VITRO*. *Gen. Comp. Endocrinol.* 51(2):208-212. Aug. 1983. SFA 28(4)
[Natl. Res. Inst. Aquacult., Tamaki, Watarai-gun, Mie, Japan]

83-002188 Inui, Y. and H. Ishioka. EFFECTS OF INSULIN AND GLUCAGON ON AMINO ACID TRANSPORT INTO THE LIVER AND OPERCULAR MUSCLE OF THE EEL *IN VITRO*. *Gen. Comp. Endocrinol.* 51(2):213-218. Aug. 1983. SFA 28(4)
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83-002189 Jönsson, A.; I. Wahlqvist and T. Hansson. EFFECTS OF HYPOPHYSECTOMY AND CORTISOL ON THE CATECHOLAMINE BIOSYNTHESIS AND CATECHOLAMINE CONTENT IN CHROMAFFIN TISSUE FROM RAINBOW TROUT, *SALMO GAIRDNERI*. *Gen. Comp. Endocrinol.* 51(2):278-285. Aug. 1983. SFA 28(4)
[Dep. Zoophysiol., Univ. Göteborg, Box 250 59, S-400 31 Göteborg, Sweden]

83-002190 Jensen, G. L. and W. L. Shelton. GONADAL DIFFERENTIATION IN RELATION TO SEX CONTROL OF GRASS CARP, *CTENOPHARYNGODON IDELLA* (PISCES: CYPRINIDAE). *Copeia* 1983(3):749-755. 1983. SFA 28(3)
[Ala. Coop. Fish. Res. Unit, Auburn Univ., Auburn 36849]

83-002191 Johnston, C. E. SEASONAL CHANGES IN GILL (Na+K)-ATPASE ACTIVITY IN ATLANTIC SALMON RETAINED IN FRESH WATER AFTER SMOLTING. *Trans. Am. Fish. Soc.* 112(5):720-724. Sept. 1983. SFA 28(4)
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[Dr. Y. Nagahama: Lab. Reprod. Biol., Natl. Inst. Basic Biol., 38 Nishigonaka, Okazaki 444, Japan]

83-002193 Kah, O.; R. E. Peter; P. Dubourg and H. Cook. EFFECTS OF MONOSODIUM L-GLUTAMATE ON PITUITARY INNERVATION IN GOLDFISH, *CARASSIUS AURATUS*. *Gen. Comp. Endocrinol.* 51(3):338-346. Sept. 1983. SFA 28(4)
[R. E. Peter: Dept. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

83-002194 Kanoh, S.; S. Watabe and K. Hashimoto. ISOLATION AND SOME PHYSICOCHEMICAL PROPERTIES OF REQUIEM SHARK MYOSIN. *Bull. Jpn. Soc. Sci. Fish.* 49(5):757-763. May 1983. SFA 28(4)
[Lab. Mar. Biochem., Fac. Agric., Univ. Tokyo, Bunkyo, Tokyo 113, Japan]

83-002195 Kawasaki, M. and K. Aoki. VISUAL RESPONSES RECORDED FROM THE OPTIC TECTUM OF JAPANESE DACE, *TRIBOLODON HAKONENSIS*. *J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 152(2):147-153. 1 Aug. 1983. SFA 28(4)
[Life Sci. Inst., Sophia Univ., Kioi-cho 7, Chiyoda-ku, Tokyo, Japan 102]

83-002196 Kimata, M. [CHANGES OF CHEMICAL COMPOSITION DURING EARLY DEVELOPMENT IN THE RED SEA BREAM *CHRYSOPHRYS MAJOR* (TEMMINCK ET SCHLEGEL) EGG AND LARVA.] *J. Fac. Mar. Sci. Technol. Tokai Univ.* No. 16. p.213-223. 1983. In Japanese with English summ. SFA 28(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan 424]

83-002197 Kimata, M. [CHANGES OF FATTY ACID COMPOSITION DURING EARLY DEVELOPMENT IN THE RED SEA BREAM *CHRYSOPHRYS MAJOR* (TEMMINCK ET SCHLEGEL) EGG AND LARVA.] *J. Fac. Mar. Sci. Technol. Tokai Univ.* No. 16. p.225-233. 1983. In Japanese with English summ. SFA 28(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan 424]

83-002198 King, P. A. and L. Goldstein. RENAL AMMONIAGENESIS AND ACID EXCRETION IN THE DOGFISH, *SQUALUS ACANTHIAS*. *Am. J. Physiol.* 245(4):R581-R589. Oct. 1983. SFA 28(4)
[Div. Biol. Med., Brown Univ., Providence, RI 02912]

83-002199 King, P. A. and L. Goldstein. RENAL AMMONIA EXCRETION AND PRODUCTION IN GOLDFISH, *CARASSIUS AURATUS*, AT LOW ENVIRONMENTAL pH. *Am. J. Physiol.* 245(4):R590-R599. Oct. 1983. SFA 28(4)
[Div. Biol. Med., Brown Univ., Providence, RI 02912]

83-002200 Kitahara, T. BEHAVIOR OF CAROTENOIDS IN THE CHUM SALMON (*ONCORHYNCHUS KETA*) DURING ANADROMOUS MIGRATION. *Comp. Biochem. Physiol. B Comp. Biochem.* 76(1):97-101. 1983. SFA 28(4)
[Chem. Lab., Dep. Gen. Educ., Otaru Univ. Commerce, Otaru, Hokkaido 047, Japan]

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83-002201 Kiyono, M. and K. Shinshima. [THERMAL TOLERANCE OF STONE FLOUNDER EGGS.] *Bull. Jpn. Soc. Sci. Fish* 49(5):701-704. May 1983. In Japanese with English summ. SFA 28(4)

[Bio-Environ. Lab., Cent. Res. Inst. Elec. Power Indus., 1646 Abiko, Abiko, Chiba 270-11, Japan] The objective was to investigate effects of short term temperature rises on the hatching success of stone flounder *Kareius bicoloratus*, eggs. Thermal treatments were carried out by transferring eggs from the base temperature seawater (10°C) into a beaker containing seawater at an elevated temperature of 4,8,12,16 or 22°C above the base temperature, and by maintaining the eggs at the elevated temperature for 0.7,2.5,10,40, 160 min or until hatching. Eggs during 8-16 Cell, Eye Forming and Beginning Of Heart Beat stages were found to be more susceptible to thermal treatments than those during morula, Embryo Encircling two thrids of the egg Membrane and Just Before Hatching. Beginning of Heart Beat stage was presumed to be the most susceptible out of the six stages tested. Median resistance times (exposure duration to 50% mortality of the control) of eggs during Beginning of Heart Beat stage were estimated as follows: ΔT=22°C--less than 0.7 min, ΔT=16°C--4 min, ΔT=12°C--58 min, ΔT=8°C--680 min.

83-002202 Kjørsvik, E. and S. Lønning. EFFECTS OF EGG QUALITY ON NORMAL FERTILIZATION AND EARLY DEVELOPMENT OF THE COD, *GADUS MORHUA* L. *J. Fish Biol.* 23(1):1-12. July 1983. SFA 28(4)

[Inst. Biol. Geol., Univ. Tromsø, P.O. Box 3085, Guleng N-9001, Tromsø, Norway] Normal cod eggs respond to insemination by a rapid cortical reaction followed by an increase in total osmolarity and a small increase in egg diameter. The chorion becomes harder, but this is a slower process reaching its maximum strength after *c*. 24h. Bad eggs are characterized by a slower or incomplete cortical reaction, resulting in a slower rise in osmolarity and a softer chorion. Bad eggs rapidly lose their capacity for fertilization. In unfertilized eggs in sea water, no cortical reaction is observed. There is, however, a rise in total osmolarity and a hardening of the chorion.

83-002203 Klovach, N. V. [THE TEMPERATURE AND SEASONAL EFFECT ON THE METABOLIC RATE OF THE AZOV SEA ATHERINE.] *Biol. Nauki (Mosc.)* 235(7):58-63. 1983. In Russian with English summ. SFA 28(4)

83-002204 Klyashtorin, L. B. and B. P. Smirnov. [ON THE ENERGY COST OF GILL VENTILATION OF FISH.] *Physiological Basis of Reproduction of Marine and Anadromous Fish. VNIRO, Moscow, USSR.* p. 76-81. 1983. In Russian with English summ. SFA 28(4)

The cost of energy spent directly on respiration is estimated by various methods. There is a substantial discrepancy between the estimates obtained by means of measuring the acceleration of the metabolic rate of fish at hypoxia and of calculating the work done by the respiration system of fish. Using special methods of continuous long-term measurements of oxygen consumption of fish at hypoxia the results obtained were very close to the estimated values. It is very likely that the energy cost of respiration ranges from 0.5 to 5% of the total metabolism and even at the intensive rate of respiration it does not exceed 5-8%.

83-002205 Klyashtorin, L. B. [THE RELATION BETWEEN THE OXYGEN-DISSOCIATION PARAMETERS OF HAEMOGLOBIN AND CHARACTERISTICS OF SENSITIVITY OF FISH TO OXYGEN.] *Physiological Basis of Reproduction of Marine and Anadromous Fish. VNIRO, Moscow, USSR.* p. 70-76. 1983. In Russian with English summ. SFA 28(4)

The paper describes methods of determining oxygen saturation curves of

PHYSIOLOGY (CONTINUED)

83-002205 CONTINUED haemoglobin taken from the whole blood of 18 marine and freshwater species of fish, which proved suitable for situations resembling field conditions and for laboratories where standard equipment is available. A satisfactory correlation is ascertained between the values of P_{50} and threshold P (0.83), the values of P_{95} and critical O_2 are also well correlated (0.80). The quantitative estimate obtained supports the evidence that the oxygen-dissociation parameters of haemoglobin are related to characteristics of sensitivity of fish to oxygen.

83-002206 Kobayashi, T. and K. Ohkuma. [ON THE DEVICE FOR STAMINA MEASUREMENT OF SALMON FRY.] *Sci. Rep. Hokkaido Salmon Hatchery* No. 37. p. 41-44. Mar. 1983. In Japanese. SFA 28(4)
[Hokkaido Salmon Hatchery, Nakanoshima, Toyohiaku, Sapporo, Hokkaido, Japan]

83-002207 Koyama, J. [LABORATORY DIURESIS OF CARP.] *Bull. Jpn. Soc. Sci. Fish.* 49(6):883-887. June 1983. In Japanese with English summ. SFA 28(4)
[Tochigi Pref. Res. Inst. Environ. Pollut., Utsunomiya, Tochigi 320, Japan]

83-002208 Kramer, D. L. THE EVOLUTIONARY ECOLOGY OF RESPIRATORY MODE IN FISHES: AN ANALYSIS BASED ON THE COSTS OF BREATHING. *Environ. Biol. Fishes* 9(2):145-158. 1 Sept. 1983. SFA 28(4)
[Dep. Biol., McGill Univ., 1205 Ave. Docteur Penfield, Montreal, PQ H3A 1B1, Canada]

83-002209 Kuz'mina, V. V. and I. L. Golovanova. EFFECT OF TEMPERATURE ON THE KINETIC CHARACTERISTICS OF CARBOHYDRASES PERFORMING MEMBRANOUS DIGESTION IN FISH. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(1):124-135. 1983. SFA 28(4)
[Inst. Biol. Inland Waters, Acad. Sci. USSR, Borok, Yaroslavl Dist., USSR]

83-002210 Lahiri, S. B.; S. K. Purohit and A. K. Ghosal. ELECTROPHORETIC PATTERNS OF THE CRUDE VENOM, SKIN EXTRACT AND SERUM OF THE INDIAN VENOMOUS CATFISH *HETEROPNEUSTES FOSSILIS* (BLOCH). *Indian J. Anim. Sci.* 53(6):693-695. June 1983. SFA 28(4)
[Coll. Vet. Anim. Sci., Univ. Udaipur, Bikaner, Rajasthan 334 001, India]

83-002211 Laurent, P.; S. Holmgren and S. Nilsson. NERVOUS AND HUMORAL CONTROL OF THE FISH HEART: STRUCTURE AND FUNCTION. *Comp. Biochem. Physiol. A Comp. Physiol.* 76(3):525-542. 1983. SFA 28(4)
[S. Nilsson: Dep. Zoophysiol., Univ. Göteborg, Box 250 59, S-400 31 Göteborg, Sweden]

83-002212 Lee, A. and R. Langer. SHARK CARTILAGE CONTAINS INHIBITORS OF TUMOR ANGIOGENESIS. *Science* 221(4616):1185-1187. 16 Sept. 1983. SFA 28(4)
[R. Langer: Whitaker Coll. Health Sci. Technol. Manage., Mass. Inst. Technol., Cambridge 02139]

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83-002213 Levina, S. and R. Gordon. METHIONINE ENKEPHALIN-INDUCED CHANGES IN PIGMENTATION OF ZEBRAFISH (CYPRINIDAE, *BRACHYDANIO RERIO*) AND RELATED SPECIES AND VARIETIES, MEASURED VIDEODENSITOMETRICALLY. I. ZEBRAFISH. *Gen. Comp. Endocrinol.* 51(3):370-377. Sept. 1983. SFA 28(4)
[R. Gordon: Dep. Pathol., Med. Fac., Univ. Manitoba, Winnipeg R3E 0W3, Canada]

83-002214 Markmann, C. and S. I. Doroshov. OVARIAN CATHETERIZATION OF THE CHANNEL CATFISH, *ICTALURUS PUNCTATUS*. *Aquaculture* 35(2):163-169. Oct. 1983. SFA 28(4)
[Dep. Anim. Sci., Univ. Calif., Davis 95616]

83-002215 Martin, R. W.; J. Myers; S. A. Sower; D. J. Phillips and C. McAuley. ULTRASONIC IMAGING, A POTENTIAL TOOL FOR SEX DETERMINATION OF LIVE FISH. *N. Am. J. Fish. Manage.* 3(3):258-264. 1983. SFA 28(4)
[Cent. Bioeng., RN-10, Univ. Wash., Seattle 98195]

83-002216 Maslennikova, N. V. [THE EFFECT OF CONSTANT HIGH TEMPERATURE OF WATER ON THE DEVELOPMENT OF EGGS AND LARVAE OF PINK SALMON ACCLIMATED OFF THE KOLA PENINSULA.] *Physiological Basis of Reproduction of Marine and Anadromous Fish. VNIRO, Moscow, USSR.* p. 61-69. 1983. In Russian with English summ. SFA 28(4)

It is shown that embryogenesis in pink salmon may proceed at a constant high temperature of water which is very close to the mean temperature (10-12°C) in the natural environment in autumn and spring. It is tentatively concluded that the upper threshold of temperature suitable for the development of eggs and larvae of pink salmon lies between 14° and 16°C when all phases of embryogenesis proceed at a constant high temperature. The influence of temperature on eggs and larvae was estimated using the assessment of the mortality rate and measurements of some morphometric characteristics of fish.

83-002217 Mayer-Gostan, N.; M. Bornancin; G. DeRenzis; R. Naon, J. A. Yee; R. L. Shew and P. K. T. Pang. EXTRAINTESTINAL CALCIUM UPTAKE IN THE KILLIFISH, *FUNDULUS HETEROCLITUS*. *J. Exp. Zool.* 227(3):329-338. Sept. 1983. SFA 28(4)
[P. K. T. Pang: Dep. Pharmacol. Therapeutics, Tex. Tech Univ. Health Sci. Cent., Lubbock 79430]

83-002218 Mikodina, E. V. and G. V. Norvillo. [SOME MORPHOPHYSIOLOGICAL CHARACTERISTICS OF MALES OF MULLET DURING THEIR SPAWNING MIGRATION AND TENTATIVE DATA ON HORMONAL STIMULATION.] *Physiological Basis of Reproduction of Marine and Anadromous Fish. VNIRO, Moscow, USSR.* p. 14-19. 1983. In Russian with English summ. SFA 28(4)

83-002219 Mikodina, E. V. and E. A. Voronina. [ON CHANGES IN THE FINE STRUCTURE OF OVARIAN FOLLICLES IN THE PRE-SPAWNING FEMALES OF THE GREY MULLET (*MUGIL CEPHALUS* L.) UNDER STRESS.] *Physiological Basis of Reproduction of Marine and Anadromous Fish. VNIRO, Moscow, USSR.* p. 19-25. 1983. In Russian with English summ. SFA 28(4)

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83-002220 Moreau, G.; C. Barbeau; J. J. Frenette; J. Saint-Onge and M. Simoneau. ZINC, MANGANESE, AND STRONTIUM IN OPERCULA AND SCALES OF BROOK TROUT (*SALVELINUS FONTINALIS*) AS INDICATORS OF LAKE ACIDIFICATION. *Can. J. Fish. Aquatic Sci.* 40(10):1685-1691. Oct. 1983. In English with French summ. SFA 28(4)
[Dep. Biol., Univ. Laval, Quebec, PQ G1K 7P4, Canada]

83-002221 Moser, M.; J. Whipple; J. Sakanari and C. Reilly. PROTANDROUS HERMAPHRODITISM IN STRIPED BASS FROM COOS BAY, OREGON. *Trans. Am. Fish. Soc.* 112(4):567-569. July 1983. SFA 28(4)
[Cent. Coastal Mar. Stud., Univ. Calif., Santa Cruz 95064]

83-002222 Munkittrick, K. R. and J. F. Leatherland. HAEMATOCRIT VALUES IN FERAL GOLDFISH, *CARASSIUS AURATUS* L., AS INDICATORS OF THE HEALTH OF THE POPULATION. *J. Fish Biol.* 23(2):153-161. Aug. 1983. SFA 28(4)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON, Canada]
Haematocrits were measured in goldfish, *Carassius auratus* L., collected in early spring and late summer from two locations in southern Ontario, Canada. At one location (Hamilton Harbour) the goldfish population suffered an epizootic of haemorrhagic lesions resulting in chronic anaemia, and at the second location (Cambridge) the goldfish population was disease-free; haematocrits of the feral fish were compared with values obtained from a commercial breeding stock (CBS), and with published haematocrit values for cyprinid fish. Haematocrits in males were larger than in females in all collections of feral fish except spring-caught (7-15°C ambient temperature) fish from Cambridge; no sex differences were evident in the immature CBS fish. Haematocrits were higher in feral female goldfish collected from higher ambient temperatures (15-25°C) than in comparable fish collected from lower ambient temperatures (4-15°C) at both collection sites, and also in males collected from Cambridge. Conversely, the haematocrit in the CBS fish was significantly decreased in fish transferred from 12 to 21°C. Haematocrits of the healthy (Cambridge) population were significantly larger than in comparable fish from Hamilton Harbour.

83-002223 Nagibina, G. V. [INFLUENCE OF SALINITY ON THE METABOLIC RATE IN COHO SALMON (*ONCHORHYNCHUS KISUTCH* WALB.) IN EARLY PERIODS OF ONTOGENESIS.] *Physiological Basis of Reproduction of Marine and Anadromous Fish. VNIRO, Moscow, USSR.* p. 57-61. 1983. In Russian with English summ. SFA 28(4)
The respiratory rate in coho salmon becomes gradually higher and reaches 0.50 ml/g/hr at the larval stage, but gets lower in fry (0.30 ml/g/hr). Strong saline solutions oppress the oxygen consumption rate of eggs (from 12°/oo and higher), of free embryos (over 14°/oo) and larvae (over 20°/oo). The respiratory rate is stimulated by low salinities. The maximun oxygen consumption rate of embryos, larvae and fry are recorded at the salinities of 6°/oo, 4°/oo and 6-8°/oo, respectively. The most favourable salinity for the growth rate of coho salmon is 6°/oo.

83-002224 Naon, R. and N. Myer-Gostan. SEPARATION BY VELOCITY SEDIMENTATION OF THE GILL EPITHELIAL CELLS AND THEIR ATPASES ACTIVITIES IN THE SEAWATER ADAPTED EEL *ANGUILLA ANGUILLA* L. *Comp. Biochem. Physiol. A Comp. Physiol.* 75(4):541-547. 1983. SFA 28(4)
[Lab. J. Maetz, Comm. Energie Atomique, B.P. 68, 06230 Villefranche-sur-Mer, France]

83-002225 Neuman, P.; G. F. Holeton and N. Heisler. CARDIAC OUTPUT AND REGIONAL BLOOD FLOW IN GILLS AND MUSCLES AFTER EXHAUSTIVE EXERCISE IN RAINBOW TROUT (*SALMO GAIRDNERI*). *J. Exp. Biol.* 105:1-14. July 1983.

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83-002225 CONTINUED SFA 28(4)
[Abt. Physiol., Max-Planck-Inst. Exp. Med., Göttingen, West Germany]

83-002226 Nikinmaa, M. ADRENERGIC REGULATION OF HAEMOGLOBIN OXYGEN AFFINITY IN RAINBOW TROUT RED CELLS. *J. Comp. Physiol. B Biochem. Syst. Environ. Physiol.* 152(1):67-72. July 1983. SFA 28(4)
[Div. Physiol., Dep. Zool., Univ. Helsinki, Arkadiankatu 7, SF-00100 Helsinki 10, Finland]

83-002227 Nunomura, W.; A. Hara; K. Takano and H. Hirai. [IMMUNOHISTOCHEMICAL LOCALIZATION OF VITELLOGENIN IN HEPATIC CELLS OF SOME SALMONID FISHES.] *Bull. Fac. Fish. Hokkaido Univ.* 34(2):79-87. June 1983. In Japanese with English summ. SFA 28(4)
[Dep. Biochem., Hokkaido Univ. Sch. Med., Hakodate, Japan]

83-002228 Ota, T. and T. Takagi. FURAN FATTY ACIDS IN THE LIPIDS OF KOKANEE, *ONCORHYNCHUS NERKA* F. *ADONIS*. *Bull. Fac. Fish. Hokkaido Univ.* 34(2):88-92. June 1983. SFA 28(4)
[Lab. Mar. Lipid Chem., Fac. Fish., Hokkaido Univ., Hakodate, Japan]

83-002229 Panarin, A. P.; N. A. Bakunov and A. A. Petrov. [TO ^{137}CESIUM-POTASSIUM DISCRIMINATION IN PAIR AT THE TRANSITION FROM THE MARINE ENVIRONMENT TO THE FISH BODY.] *Ecological Aspects of Chemical and Radioactive Pollution of Aquatic Environment. VNIRO, Moscow, USSR.* 14-18. 1983. In Russian with English summ. SFA 28(4)

83-002230 Pankhurst, N. W. and J. N. Lythgoe. CHANGES IN VISION AND OLFACTION DURING SEXUAL MATURATION IN THE EUROPEAN EEL *ANGUILLA ANGUILLA* (L.). *J. Fish Biol.* 23(2):229-240. Aug. 1983. SFA 28(4)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

83-002231 Paul, D. H. and B. L. Roberts. THE ACTIVITY OF CEREBELLAR NUCLEAR NEURONES IN RELATION TO STIMULI WHICH EVOKE A PECTORAL FIN REFLEX IN DOGFISH. *J. Physiol. (Lond.)* 342:465-481. Sept. 1983. SFA 28(4)
[Dep. Physiol., Manchester Univ., Manchester M13 9PT, England]

83-002232 Petukhov, S. A.; N. P. Morozov and M. S. Dobrusin. THE DISTRIBUTION OF TRACE ELEMENTS FROM THE GROUP OF HEAVY AND TRANSIENT METALS OVER PARTS OF THE BODY AND TISSUES OF FISH. *Ecological Aspects of Chemical and Radioactive Pollution of Aquatic Environment. VNIRO, Moscow, USSR.* 41-47. 1983. In Russian with English summ. SFA 28(4)

83-002233 Pietkiewicz, J.; I. Kustrzeba-Wójcicka and E. Wolna. PURIFICATION AND PROPERTIES OF ENOLASE FROM CARP (*CYPRINUS CARPIO*). COMPARISON WITH ENOLASES FROM MAMMALS' MUSCLES AND YEAST. *Comp. Biochem. Physiol. B Comp. Biochem.* 75(4):693-698. 1983. SFA 28(4)
[Dep. Biochem., Med. Sch., ul. Chalubinskiego 10, 50-368 Worclaw, Poland]

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83-002234 Portugal, T. R. and A. Aksnes. ARGINASE ACTIVITY IN DIFFERENT FISH SPECIES AND TISSUES. *Comp. Biochem. Physiol. B Comp. Biochem.* 76(1):15-16. 1983. SFA 28(4)
[Food Nutr. Res. Inst., NSTA, Pedro Gil St. Ermita, Manila, 2801, Philippines]

83-002235 Potts, W. T. W. and K. Oates. THE IONIC CONCENTRATIONS IN THE MITOCHONDRIA-RICH OR CHLORIDE CELL OF *FUNDULUS HETEROCLITUS*. *J. Exp. Zool.* 227(3):349-359. Sept. 1983. SFA 28(4)
[Dep. Biol. Sci., Univ. Lancaster, Lancaster LA1 4YQ Lancashire, England]

83-002236 Powers, E. A. AN *IN VITRO* CULTURE OF GUPPY CHROMATOPHORES. *M.S. thesis, Univ. West Fla.* 1982. Abstract only. From Masters Abstr. 21(3):222. Sept. 1983. SFA 28(4)

83-002237 Priede, I. G. HEART RATE TELEMETRY FROM FISH IN THE NATURAL ENVIRONMENT. *Comp. Biochem. Physiol. A Comp. Physiol.* 76(3):515-524. 1983. SFA 28(4)
[Univ. Aberdeen, Dep. Zool., Tillydrone Ave., Aberdeen AB9 2TN, Scotland]

83-002238 Rich, A. A. SMOLTING: CIRCULATING CATECHOLAMINE AND THYROXINE LEVELS IN COHO SALMON *(ONCORHYNCHUS KISUTCH)*. *Ph.D. dissertation, Univ. Wash.* 106p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(4):980. Oct. 1983. SFA 28(4)

83-002239 Rodgers, D. W. and J. S. Griffiths. EFFECTS OF ELEVATED THERMAL REGIMES ON SURVIVAL OF RAINBOW TROUT (*SALMO GAIRDNERI*) ALEVINS. *J. Great Lakes Res.* 9(3):421-424. 1983. SFA 28(4)
[Biol. Res. Sect., Chem. Res. Dep., Ontario Hydro, 800 Kipling Ave., Toronto, ON M8Z 5S4, Canada] Embryos of fall spawning rainbow trout were incubated and alevins reared under thermal regimes characterisitc of ambient winter nearshore Lake Ontario and elevated thermal regimes 2 and 5 C° warmer than ambient. Embryos incubated under elevated thermal regimes hatched and attained 50% swim-up sooner than embryos incubated under the ambient thermal regime. In general, mortality of alevins at 21 and 28 days after swim-up was low for all rearing thermal regimes. The generally low mortality of alevins incubated and reared under the various thermal regimes suggests that rainbow trout alevins have fairly broad thermal tolerances when food is provided to excess.

83-002240 Rodrigues, K. and J. P. Sumpter. THE DISTRIBUTION OF SOME PROOPIOMELANOCORTIN-RELATED PEPTIDES IN THE PITUITARY GLAND OF THE RAINBOW TROUT, *SALMO GAIRDNERI*. *Gen. Comp. Endocrinol.* 51(3):454-459. Sept. 1983. SFA 28(4)
[Dep. Appl. Biol., Sch. Biol. Sci., Brunel Univ., Uxbridge UB8 3PH, Middlesex, England]

83-002241 Rodrigues, K. T.; B. G. Jenks and J. P. Sumpter. BIOSYNTHESIS OF PRO-OPIOMELANOCORTIN-RELATED PEPTIDES IN THE NEUROINTERMEDIATE LOBE OF THE PITUITARY GLAND OF THE RAINBOW TROUT *(SALMO GAIRDNERI)*. *J. Endocrinol.* 98(2):271-282. Aug. 1983. SFA 28(4)
[Dep. Appl. Biol., Fac. Math. Sci., Brunel Univ., Uxbridge, Middlesex UB8 3PH, England]

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83-002242 Ross, R. M.; G. S. Losey and M. Diamond. SEX CHANGE IN A CORAL-REEF FISH: DEPENDENCE OF STIMULATION AND INHABITION ON RELATIVE SIZE. *Science* 217(4610):574-575. 5 Aug. 1983. SFA 28(4)

[Hawaii Inst. Mar. Biol., P.O. Box 1346, Kaneohe 96744] The removal of a single dominant individual has been shown to trigger a sex change in some coral-reef fish. In the saddleback wrasse (*Thalassoma duperrey*), however, female-to-male sex change requires visual stimulation from smaller conspecifics. This change is not dependent on the sex or color of the stimulus fish and can be inhibited by larger conspecifics. On the reef, a female probably changes sex when the relative numbers of larger and smaller conspecifics change within her home range.

83-002243 Sánchez-Muniz, F.; M. de la Higuera; E. Muñoz-Martínez and G. Varela. INFLUENCE OF *HANSENULA ANOMALA* YEAST INTAKE ON THE LIVER AND KIDNEY METABOLISM OF THE TROUT *(SALMO GAIRDNERI)*. *Comp. Biochem. Physiol. A Comp. Physiol.* 75(4):609-613. 1983. SFA 28(4)

[Dep. Fisiol. Anim., Fac. Farm., Univ. Complutense, Madrid-3, Spain]

83-002244 Sagi, G.; M. Abraham and V. Hilge. PINEALECTOMY AND OVARIAN DEVELOPMENT IN THE GREY MULLET, *LIZA RAMADA*. *J. Fish Biol.* 23(3):339-345. Sept. 1983. SFA 28(4)

[Hebrew Univ. Jerusalem, Dep. Zool., Jerusalem, Israel]

83-002245 Sakai, D. K. A COMPARISON OF ANTIBODY RESPONSES OF RAINBOW TROUT, SEA RUN RAINBOW TROUT, AND MUTANTS. *Bull. Jpn. Soc. Sci. Fish.* 49(6):849-851. June 1983. SFA 28(4)

[Hokkaido Fish Hatchery, Nakanoshima-2, Toyohira, Sapporo 062, Japan]

83-002246 Sakai, T. and H. Kawatsu. DISTRIBUTION OF DIPEPTIDYL AMINOPEPTIDASE IV IN CULTURED FISHES. *Bull. Jpn. Soc. Sci. Fish.* 49(5):683-686. May 1983. In Japanese with English summ. SFA 28(4)

[Fac. Agric., Miyazaki Univ., Funatsuka-3, Miyazaki 880, Japan]

83-002247 Sakai, T.; H. Kawatsu and O. Gotoh. [INTRACELLULAR DISTRIBUTION AND ENZYMATIC PROPERTIES OF BILIRUBIN UDP GLUCURONYL TRANSERASE IN CARP, EEL AND YELLOWTAIL.] *Bull. Jpn. Soc. Sci. Fish.* 49(5):679-682. May 1983. In Japanese with English summ. SFA 28(4)

[Fac. Agric., Miyazaki Univ., Funatsuka-3, Myazaki 880, Japan]

83-002248 Saldaña, J. and B. Venables. ENERGY COMPARTMENTALIZATION IN A MIGRATORY FISH, *PROCHILODUS MARIAE* (PROCHILODONTIDAE), OF THE ORINOCO RIVER. *Copeia* 1983(3):617-623. 1983. SFA 28(4)

[Dep. Cienc. Biol., Univ. Nac. Jose Faustino Sanchez Carrion, Apt. 81 Huacho, Peru]

83-002249 Saunders, R. L.; E. B. Henderson; P. R. Harmon; C. E. Johnston and J. G. Eales. EFFECTS OF LOW ENVIRONMENTAL PH ON SMOLTING OF ATLANTIC SALMON (*SALMO SALAR*). *Can. J. Fish. Aquatic Sci.* 40(8):1203-1211. Aug. 1983. In English with French summ. SFA 28(4)

[Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

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83-002250 Schoots, A. F. M.; J. M. Ruijter; J. A. M. Van Kemenade and J. M. Denucé. IMMUNOREACTIVE PROLACTIN IN THE PITUITARY GLAND OF CYPRINODONT FISH AT THE TIME OF HATCHING. *Cell Tissue Res.* 233(3):611-618. Sept. 1983. SFA 28(4)
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83-002251 Scott, A. P. and J. P. Sumpter. A COMPARISON OF THE FEMALE REPRODUCTIVE CYCLES OF AUTUMN-SPAWNING AND WINTER-SPAWNING STRAINS OF RAINBOW TROUT (*SALMO GAIRDNERI* RICHARDSON). *Gen. Comp. Endocrinol.* 52(1):79-85. Oct. 1983. SFA 28(4)
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83-002252 Seiler, K.; R. Seiler; R. Claus and G. Sterba. SPECTROPHOTOMETRIC ANALYSES OF HYDROXYSTEROID DEHYDROGENASE ACTIVITY IN PRESUMED STEROID-PRODUCING TISSUES OF THE BROOK LAMPREY (*LAMPETRA PLANERI* BLOCH) IN DIFFERENT DEVELOPMENTAL STAGES. *Gen. Comp. Endocrinol.* 51(3):353-363. Sept. 1983. SFA 28(4)
[Dep. Cell Biol. Regul., Sect. Biosci., Marx Univ., Leipzig, West Germany]

83-002253 Shapiro, D. Y. BEHAVIOURAL CHANGES OF PROTOGYNOUS SEX REVERSAL IN A CORAL REEF FISH IN THE LABORATORY. *Anim. Behav.* 29(4):1185-1198. Nov. 1981. SFA 28(4)
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83-002254 Shapiro, D. Y. INTRAGROUP BEHAVIOURAL CHANGES AND THE INITIATION OF SEX REVERSAL IN A CORAL REEF FISH IN THE LABORATORY. *Anim. Behav.* 29(4):1199-1212. Nov. 1981. SFA 28(4)
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The minimum standard metabolic rate in juveniles of grey mullet ($R = 0.150W^{0.620}$) is registered at the temperature of 5°C in December. In April when the temperature rises to 11.5 and 14.3°C the metabolic intensity rate becomes higher ($R = 0.236W^{0.736}$ and $R = 0.291\ W^{0.827}$ respectively). In winter the metabolic intensity acceleration rate is the same in fish of various sizes ($Q = 2.5 \div 2.7$), but in spring it becomes lower in small-sized fish ($Q = 1.5 \div 2.0$) and higher in big-sized fish ($Q = 2.9 \div 3.1$). The daily food rations estimated by the respiration method for fish of various sizes are as follows: 3.87-7.67% of the body weight at 5°C, 4.71-9.17% at 8°C and 6.71-13.83% at 11.5°C.

83-002256 Sheridan, M. A.; W. V. Allen and T. H. Kerstetter. SEASONAL VARIATIONS IN THE LIPID COMPOSITION OF THE STEELHEAD TROUT, *SALMO GAIRDNERI* RICHARDSON, ASSOCIATED WITH THE PARR-SMOLT TRANSFORMATION. *J. Fish Biol.* 23(2):125-134. Aug. 1983. SFA 28(4)
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[Dep. Anat. Embryol., Univ. Nijmegen, Fac. Med., 6500 HB Nijmegen, Netherlands]

83-002258 Smith, R. J. F. and J. D. Smith. SEASONAL LOSS OF ALARM SUBSTANCE CELLS IN *CHROSOMUS NEOGAEUS*, *NOTROPIS VENUSTUS* AND *N. WHIPPLEI*. *Copeia* 1983(3):822-826. 1983. SFA 28(4)
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[Dep. Zool., Univ. Gorakhpur, Gorakhpur-273001, India]

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[Dep. Zool., Univ. Gorakhpur, Gorakhpur-273001, India]

83-002261 Sternik, K. UNTERSUCHUNGEN ZUR PHOSPHOR-ABGABE UND INSBESONDERE ZUR ORTHOPHOSPHAT-EXKRETION JUNGER KARPFEN (*CYPRINUS CARPIO* L.) EIN BEITRAG ZUR PHOSPHOR-REMOBILISIERUNG GEWÄSSERN. [PHOSPHORUS RELEASE AND ESPECIALLY ORTHOPHOSPHATE EXCRETION BY YOUNG CARP (*CYPRINUS CARPIO* L.) A CONTRIBUTION ON PHOSPHORUS REGENERATION IN LAKES.] *Arch Hydrobiol. Supplementb.* 66(1):1-82. 1983. In German with English summ. SFA 28(4)
[Komturweg 4, D-7750 Konstang 16, West Germany]

83-002262 Stewart, D. J.; D. Weininger; D. V. Rottiers and T. A. Edsall. AN ENERGETICS MODEL FOR LAKE TROUT, *SALVELINUS NAMAYCUSH*: APPLICATION TO THE LAKE MICHIGAN POPULATION. *Can. J. Fish. Aquatic Sci.* 40(6):681-698. June 1983. In English with French summ. SFA 28(4)
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[Lab. Fish. Physiol., Fac. Agric., Univ. Tokyo, Bunkyo, Tokyo 113, Japan]

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[Lab. Fresh-Water Fish-Culture, Fac. Fish., Hokkaido Univ., Hakodate, Japan]

83-002267 Takemoto, Y.; T. Nakajima; Y. Hasegawa; T. X. Watanabe; H. Sokabe; S. Kumagae and S. Sakakibara. CHEMICAL STRUCTURES OF ANGIOTENSINS FORMED BY INCUBATING PLASMA WITH THE KIDNEY AND THE CORPUSCLES OF STANNIUS IN THE CHUM SALMON, *ONCORHYNCHUS KETA*. *Gen. Comp. Endocrinol.* 51(2):219-227. Aug. 1983. SFA 28(4)
[Inst. Med. Dent. Eng., Tokyo Med. Dent. Univ., Tokyo 101, Japan]

83-002268 Talbot, C. and P. J. Higgins. A RADIOGRAPHIC METHOD FOR FEEDING STUDIES ON FISH USING METALLIC IRON POWDER AS A MARKER. *J. Fish Biol.* 23(2):211-220. Aug. 1983. SFA 28(4)
[Freshwater Fish. Lab., Pitlochry, Scotland] A novel method for studying trophic dynamics of fish is described which involves X-raying animals which have been fed a diet labelled with metallic iron powder. Results of feeding studies on juvenile Atlantic salmon, *Salmo salar* L., are presented which demonstrate that food consumption and gastric evacuation rates can be measured without incurring the major disadvantages of force feeding, starvation or autopsy which are associated with most of the established methods.

83-002269 Taylor, D. J. HYPOPHYSECTOMY DECREASES RETINAL PORPHYROPSIN IN THE BROOK TROUT *(SALVELINUS FONTINALIS)*. *Rev. Can. Biol. Exp.* 42(2):177-181. July 1983. SFA 28(4)
[Biol. Dep., Hiram Coll., Hiram, OH 44234] Hypophysectomy of brook trout (*Salvelinus fontinalis*) results in a decrease in retinal porphyropsin in animals maintained for one month under continuous light. After one month in continuous darkness, retinal porphyropsin decreases to zero percent in all hypophysectomized fish. The effect of hypophysectomy is reversed by treatment with 1 mg/liter of L-thyroxine in the aquarium water for one month. The results indicate that light-induced changes in visual pigment proportions are partly dependent upon factors regulated by the pituitary.

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[Dep. Biochem., Univ. Bergen, Aarstadveien 19, N-5000 Bergen, Norway]

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[Lab. Physiol. Anim., Fac. Sci. Tech., F-29283 Brest Cédex, France]

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[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

83-002274 Tucker, B. W. STUDIES ON VITAMIN C METABOLISM IN RAINBOW TROUT. *Ph.D. dissertation, Univ. Wash.* 163p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(4):962. Oct. 1983. SFA 28(4)

83-002275 Ueda, H.; Y. Nagahama; F. Tashiro and L. W. Crim. SOME ENDOCRINE ASPECTS OF PRECOCIOUS SEXUAL MATURATION IN THE AMAGO SALMON *ONCORHYNCHUS RHODURUS*. *Bull. Jpn. Soc. Sci. Fish.* 49(4):587-596. Apr. 1983. SFA 28(4)
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83-002276 Van Waarde, A. and F. Kesbeke. GOLDFISH MUSCLE ENERGY METABOLISM DURING ELECTRICAL STIMULATION. *Comp. Biochem. Physiol. B Comp. Biochem.* 75(4):635-639. 1983. SFA 28(4)
[Cell. Biol. Morphogenesis Unit, Zool. Lab., Kaiderstr. 63, 2311 GP Leiden, Netherlands]

83-002277 Veltishcheva, I. F. [INFLUENCE OF SALINITY ON SOME SPECIES OF FISH AT EARLY STAGES OF DEVELOPMENT.] *Physiological Basis of Reproduction of Marine and Anadromous Fish. VNIRO, Moscow, USSR.* p. 44-52. 1983. In Russian with English summ. SFA 28(4)
The experiments on maintaining eggs of pink and coho salmon (from the eye stage) and larvae prior to they start feeding in solutions with 2-24^{o}/oo salinity show that the incubation of eggs in the 4-6^{o}/oo salinity water yields the best result. Eggs and newly-hatched larvae do not tolerate the 12^{o}/oo salinity. Their salt resistance increases with growth.

83-002278 Vislie, T. CELL VOLUME REGULATION IN FISH HEART VENTRICLES WITH SPECIAL REFERENCE TO TAURINE. *Comp. Biochem. Physiol. A Comp. Physiol.* 76(3):507-514. 1983. SFA 28(4)
[Inst. Biol., Odense Univ., DK-5230 Odense M, Denmark]

83-002279 Voronina, E. A. [MANIFESTATION FORMS OF THE TOTAL RESORPTION OF OOCYTES IN PRE-SPAWNING GREY MULLET (*MUGIL CEPHALUS* L.).] *Physiological Basis of Reproduction of Marine and Anadromous Fish. VNIRO, Moscow, USSR.* p. 7-13. 1983. In Russian with English summ. SFA 28(4)

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[Dep. Biol. Sci., Sheffield City Polytech., Pond Street, Sheffield S1 1WB, England]

83-002281 Watabe, S.; J. Maruyama and K. Hashimoto. MYOFIBRILLAR ATPASE ACTIVITY OF MACKEREL ORDINARY AND DARK MUSCLES. *Bull. Jpn. Soc. Sci. Fish.* 49(4):655. SFA 28(4)
[Lab. Mar. Biochem., Fac. Agric., Univ. Tokyo, Bunko, Tokyo 113, Japan]

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[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 2A9, Canada]

83-002283 Weil, C. and L. W. Crim. ADMINISTRATION OF LHRH ANALOGUES IN VARIOUS WAYS: EFFECT ON THE ADVANCEMENT OF SPERMIATION IN PRESPAWNING LANDLOCKED SALMON, *SALMO SALAR*. *Aquaculture* 35(2):103-115. Oct. 1983. SFA 28(4)
[Lab. Physiol. Poissons, INRA, 78350 Jouy en Josas, France]

83-002284 Whitehead, C.; N. R. Bromage and B. Breton. CHANGES IN SERUM LEVELS OF GONADOTROPIN, OESTRADIOL 17β AND VITELLOGENIN DURING THE FIRST AND SUBSEQUENT REPRODUCTIVE CYCLES OF FEMALE RAINBOW TROUT. *Aquaculture* 34(3-4):317-326. Aug. 1983. SFA 28(4)
[Fish Cult. Unit, Dep. Biol. Sci., Univ. Aston in Birmingham, Gosta Green, Birmingham B4 7ET, England]

83-002285 Woodward, B. SENSITIVITY OF HEPATIC D-AMINO ACID OXIDASE AND GLUTATHIONE REDUCTASE TO THE RIBOFLAVIN STATUS OF THE RAINBOW TROUT (*SALMO GAIRDNERI*). *Aquaculture* 34(3-4):193-201. Aug. 1983. SFA 28(4)
[Dep. Nutr., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]
Two hepatic enzymes, D-amino acid oxidase (DAAO) and glutathione reductase (GR), were assessed for their potential to determine the riboflavin requirement of rainbow trout (*Salmo gairdneri*). Both enzymes exhibit sufficient activity to permit precise quantification in fry, fingerlings and young juveniles. Hepatic GR activity was not affected, even in severely riboflavin-deficient fish. DAAO activity was depressed by riboflavin deficiency, and appeared to provide a more sensitive indicator of incipient vitamin insufficiency than either tissue flavin storage or grossly observable symptoms. DAAO activity was not affected by reduced feed intake as indicated by examination of pair-fed controls. The results suggest that liver maximal DAAO activity may prove useful for determining the riboflavin requirement of young rainbow trout.

83-002286 Wurtsbaugh, W. A. and J. J. Cech, Jr. GROWTH AND ACTIVITY OF JUVENILE MOSQUITOFISH: TEMPERATURE AND RATION EFFECT. *Trans. Am. Fish. Soc.* 112(5):653-660. Sept. 1983. SFA 28(4)
[Dep. Fish. Wildl., UMC 52, Utah State Univ., Logan 84322]

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83-002289 Young, G.; H. Kagawa and Y. Nagahama. EVIDENCE FOR A DECREASE IN AROMATASE ACTIVITY IN THE OVARIAN GRANULOSA CELLS OF AMAGO SALMON (*ONCORHYNCHUS RHODURUS*) ASSOCIATED WITH FINAL OOCYTE MATURATION. *Biol. Reprod.* 29(2):310-315. Sept. 1983. SFA 28(4)
[Dr. Y. Nagahama: Lab. Reprod. Biol., Natl. Inst. Basic Biol., 38 Nishigonaka, Okazaki 444, Japan]

83-002290 Youson, J. H.; P. A. Sargent and E. W. Sidon. IRON LOADING IN THE LIVER OF PARASITIC ADULT LAMPREYS, *PETROMYZON MARINUS* L. *Am. J. Anat.* 168(1):37-49. Sept. 1983. SFA 28(4)
[Life Sci., Scarborough Coll., Univ. Toronto, West Hill, ON M1C 1A4, Canada]

83-002291 Yunchiang, F. and W. Min. [ON THE MECHANISM OF THE ACTION OF HYPOTHALAMIC LUTEINIZING HORMONE-RELEASING HORMONE ANALOGUE (LRH-A) III. ITS EFFECT ON THE ULTRASTRUCTURE OF THE GONADOTROPHIC CELLS OF THE PITUITARY GLAND OF *TIPAPIA MOSSAMBICA*.] *Acta Zool. Sin.* 29(2):124-128. 1983. In Chinese with English summ. SFA 28(4)
[Third Oceanogr. Inst., Natl. Oceanogr. Bur., Xiamen, China]

83-002292 Zolotnitskij, A. P. [THE ECONOLOGO-HISTOPHYSIOLOGICAL AND EXPERIMENTAL STUDY OF THE GONADOTROPIC FUNCTION OF THE PITUITARY IN THE TURBOT (*SCOPHTHALMUS MAEOTICUS MAEOTICUS*, PALLAS).] *Physiological Basis of Reproduction of Marine and Anadromous Fish. VNIRO, Moscow, USSR.* p. 35-44. 1983. In Russian with English summ. SFA 28(4)

83-002293 Zyuganov, V. V. [GENETICALLY-DETERMINATE DIFFERENCES IN IONIC PERMEABILITY OF THE PLASMATIC MEMBRANE OF STICKLEBACKS SPERMATOZOA.] *Proc. All-Union Genet. Sel. Breed. Hybridization Fish.* 2:59-63. 1983. In Russian with English summ. SFA 28(4)

GENETICS, VARIATION STUDIES AND HYBRIDIZATION

83-002294 Andersson, L.; N. Ryman and G. Ståhl. PROTEIN LOCI IN THE ARCTIC CHARR, *SALVELINUS ALPINUS* L.: ELECTROPHORETIC EXPRESSION AND GENETIC VARIABILITY PATTERNS. *J. Fish Biol.* 23(1):75-94. July 1983. SFA 28(4)
[N. Ryman: Dep. Genet., Univ. Stockholm, S-106 91 Stockholm, Sweden] In the search for electrophoretically detectable protein loci in the Arctic charr,

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

83-002294 CONTINUED *Salvelinus alpinus* L., tissue samples of eye, liver, and muscle from a total of 934 specimens collected at 10 Swedish localities were analysed. General protein staining and specific staining for 33 enzymes revealed 52 detectable loci; 37 of which were considered usable in population surveys. Variability was observed at four loci coding for esterase (est-2), the liver-specific form of lactate dehydrogenase (ldh-3), and the skeletal muscle form of malate dehydrogenase (mdh-4,5); genetic variation at loci coding for ldh-3 and mdh-4,5 has not previously been described in the Arctic charr. Relating our results to the multiple locus studies presented in the literature including Arctic charr from Ireland and North America reveals polymorphism at approximately one-third of the loci studied in the Arctic charr, and the fraction of variable loci does not appear lower in this species than in other salmonids. There were highly significant allele frequency differences between samples. Nevertheless, there was a high degree of genetic similarity among all the populations sampled indicating that they were derived from a relatively recent common ancestor. The results are discussed in relation to the current controversy concerning the number of major evolutionary lines in Scandinavian Arctic charr.

83-002295 Andriyasheva, M. A.; A. B. Lokshina and G. V. Efanov. [LINES, METHODS AND RESULTS OF CHOICE OF CHARACTERISTICS IN SELECTIVE BREEDING OF PELED.] *Proc. All-Union Meet. Genet. Sel. Breed. Hybridization Fish.* 2:86-93. 1983. In Russian with English summ. SFA 28(4)

Based on the study of phenotypic and genotypic variability in peled three main selection characteristics are chosen: time of spawning in females, relative fecundity and body weight. The groups of early- and late-maturing females were distinguished by the allele frequency for the locus of albumins. The value of utilized heredity in respect to the time spawning was the maximum in both groups (close to 1) and as to relative fecundity it was 0.52-0.57. The selection of fish on the basis of fecundity and body weight (towards the plus side) was followed by an increase in the level of heterozygosis for alleles of albumins and esterases as well as by improvement of reproductive capacities of fish.

83-002296 Beckwitt, R. GENETIC STRUCTURE OF *GENYONEMUS LINEATUS*, *SERIPHUS POLITUS* (SCIAENIDAE) AND *PARALABRAX CLATHRATUS* (SERRANIDAE) IN SOUTHERN CALIFORNIA. *Copeia* 1983(3):691-696. 1983. SFA 28(4)

[Vantuna Res. Group, Dep. Biol., Occidental Coll., Los Angels, CA 90041] The population genetic structure of three species of coastal marine fishes was studied by means of starch gel enzyme electrophoresis. Average heterozygosity was 0.030 for *Genyonemus lineatus*, 0.043 for *Seriphus politus* and 0.019 for *Paralabrax clathratus*, based on 34, 36 and 38 gene loci respectively. There were no significant differences among samples for any of the species, either for any polymorphic locus or for genetic distance based on the average of all loci. Since all three species possess planktonic larval stages, and may also move as adults, similarities among samples are attributed to significant amounts of gene flow in the Southern California Bight.

83-002297 Dorofeeva, T. A. and A. I. Nikolaev. [COMPARATIVE CHARACTERISTICS OF BESTER OF THE FIRST GENERATION, BACK-CROSSED HYBRIDS WITH GREAT STURGEON AND GREAT STURGEON UNDER DIFFERENT RAISING CONDITIONS.] *Proc. All-Union Meet. Genet. Sel. Breed. Hybridization Fish.* 2:98-102. 1983. In Russian with English summ. SFA 28(4)

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

83-002298 Dushchenko, V. V. [THE RATIO OF GENETIC STABILITY AND VARIABILITY IN THE POPULATIONS OF BLANTNOSE RATTAIL FROM THE NORTH ATLANTIC.] *Proc. All-Union Meet. Genet. Sel. Breed. Hybridization Fish.* 2:34-37. 1983. In Russian with English summ. SFA 28(4)

83-002299 Gruzdev, A. I. and V. S. Sidorov. [VARIABILITY OF LACTATE DEHYDROGENASE IN SALMON FISH IN KARELIA.] *Proc. All-Union Meet. Genet. Sel. Breed. Hybridization Fish.* 2:15-18. 1983. In Russian with English summ. SFA 28(4)

83-002300 Hagen, D. W. and D. M. Blouw. HERITABILITY OF DORSAL SPINES IN THE FOURSPINE STICKLEBACK *(APELTES QUADRACUS)*. *Heredity* 50(3):275-281. June 1983. SFA 28(4)

[Dep. Biol., Univ. New Brunswick, Fredericton, NB E3B 6E1, Canada] Heritabilities of dorsal spine number in *Apeltes quadracus* are estimated for four widely separated sites in New Brunswick, Canada. The additive genetic variance is high with values ranging from 0.47 ± 0.049 to 0.80 ± 0.128; average heritability for the four sites is 0.61 ± 0.068. The sexes do not differ for estimates. Directional selection over three generations shows a rapid response suggesting that few loci are involved and that stabilizing selection acts on natural populations.

83-002301 Halliburton, R.; R. E. Pipkin and G. A. E. Gall. REPRODUCTIVE SUCCESS OF ARTIFICIALLY HYBRIDIZED GOLDEN TROUT (*SALMO AGUABONITA*) AND RAINBOW TROUT (*SALMO GAIRDNERI*). *Can. J. Fish. Aquatic Sci.* 40(8):1264-1269. Aug. 1983. In English with French summ. SFA 28(4)

[Dep. Biol., West. Conn. State Univ., Danbury 06810]

83-002302 Ivanenkov, V. V. [ELECTROPHORETIC VARIANTS OF CARBOXYL ESTERASE-2 IN THE POPULATION OF THE LOACH, *MISGURNUS FOSSILIS* (L.) AND TRANSFORMATIONS OF PHENOTYPES OF ADULT FISH IN RELATION TO MAINTENANCE CONDITIONS.] *Proc. All-Union Meet. Genet. Sel. Breed. Hybridization Fish.* 2:38-43. 1983. In Russian with English summ. SFA 28(4)

83-002303 Johnson, C. R.; D. A. Ratkowsky and R. W. G. White. MULTIVARIATE ANALYSIS OF THE PHENOTYPIC RELATIONSHIPS OF THE SPECIES OF *PARAGALAXIAS* AND *GALAXIAS* (PISCES: GALAXIIDAE) IN TASMANIA. *J. Fish Biol.* 23(1):49-63. July 1983. SFA 28(4)

[R.W.G. White: Dep. Zool., Univ. Tasmania, Box 235C, G.P O. Hobart, Tasmania, Australia 7001]

83-002304 Kajdanova, T. I. [THE COMPARATIVE KARYOLOGIC ANALYSIS OF FIVE SPECIES OF THE GENUS *COREGONUS*.] *Proc. All-Union Meet. Genet. Sel. Breed. Hybridization Fish.* 2:73-78. 1983. In Russian with English summ. SFA 28(4)

83-002305 Kallman, K. D. THE SEX DETERMINING MECHANISM OF THE POECILIID FISH, *XIPHOPHORUS MONTEZUMAE*, AND THE GENETIC CONTROL OF THE SEXUAL MATURATION PROCESS AND ADULT SIZE. *Copeia* 1983(3):755-769. 1983. SFA 28(4)

[Osborn Lab. Mar. Sci., N.Y. Zool. Soc., Brooklyn 11224]

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

83-002306 Kamshilin, I. N. [ON POLYMORPHISM OF SERUM ALBUMINS AND TRANSFERRINES OF THE CASPIAN SEA STURGEON FISH.] *Proc. All-Union Meet. Genet. Sel. Breed. Hybridization Fish.* 2:25-29. 1983. In Russian with English summ. SFA 28(4)

83-002307 Logvinenko, B. M.; G. N. Nefedov; L. M. Massal'skaya and I. B. Polyanskaya. [THE POPULATION ANALYSIS OF GRENADIER BASED ON GENETIC POLYMORPHISM ON NON-SPECIFIC ESTERASES AND MYOGENES.] *Proc. All-Union Meet. Genet. Sel. Breed. Hybridization Fish.* 2:29-34. 1983. In Russian with English summ. SFA 28(4)

83-002308 Lokshina, A. B. [COMPARATIVE ELECTROPHORETIC ANALYSIS OF PROTEINS OF *COREGONUS* SPP.] *Proc. All-Union Meet. Genet. Sel. Breed. Hybridization Fish.* 2:19-24. 1983. In Russian with English summ. SFA 28(4)

83-002309 Mantel'man, I. I. [EVALUATION OF PELED SPAWNERS BY THE VITAL CAPACITY OF THEIR OFFSPRING.] *Proc. All-Union Meet. Genet. Sel. Breed. Hybridization Fish.* 2:93-98. 1983. In Russian with English summ. SFA 28(4)

83-002310 Maslova, M. N. and E. V. [Ozirskaya. SOME BIOCHEMICAL CHARACTERISTICS OF FISH BRAIN AS AN ADDITIONAL CRITERIUM FOR SOLVING SYSTEMATICAL PROBLEMS.] *Proc. All-Union Meet. Genet. Sel. Breed. Hybridization Fish.* 2:54-59. 1983. In Russian with English summ. SFA 28(4)

83-002311 McKenzie, W. D., Jr.; D. Crews; K. D. Kallman; D. Policansky and J. J. Sohn. AGE, WEIGHT AND THE GENETICS OF SEXUAL MATURATION IN THE PLATYFISH, *XIPHOPHORUS MACULATUS*. *Copeia* 1983(3):770-774. 1983. SFA 28(4)
[Bioassay Systems Corp., 225 Wildwood Ave., Woburn, MA 01801] In order to elucidate the relationship between age, weight, genotype and sexual maturation, we raised male platyfish, *Xiphophorus maculatus*, of two "maturation" genotypes under a wide variety of environmental conditions. In spite of enormous variation in the ages and weights at sexual maturation, the two maturation genotypes produced phenotypes that were almost completely distinguishable on the basis of their ages and weights at maturation. The demographic correlates of maturation within a genotype were an inseparable combination of age and weight.

83-002312 Mirza, J. A. INDUCEMENT OF SEX REVERSAL IN SILVER CARP. *Ph.D. dissertation, Auburn Univ.* 72p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(3):654. 1983. SFA 28(4)
Genetic sex of silver carp (*Hypophthalmichthys molitrix*) was determined by artificial gynogenesis. Gynogenetic silver carp offsprings were exclusively females, suggesting female homogamety in this species. Neither cold nor warm shock greatly increased the yield of gynogenetic diploids. Heat shock was more effective in inducing diploid gynogenesis in silver carp. Treatment with methyltestosterone suspended in dimethylpolysiloxane was ineffective in reversing the phenotypic sex of silver carp, but suppressed the gonadal development in fish treated at smaller size while the gonads of the larger fish were unaffected. The methyltestosterone silastic implant treatment had an adverse effect on the gonads of some fish treated at 95-120 mm in length and 68-79 days old. However, silastic implant treatment successfully induced sex reversal to about 64% of the genetic females at 100-110 mm in length and 124 days old. Eighty percent of the females were sex reversed in one treatment when 319-day-old silver carp fingerlings were treated with 5 mg MT-silastic implants at 90-100 mm in length. The *in*

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

83-002312 CONTINUED *vivo* released rate of methyltestosterone from 5 mg silastic implants varied from 5.36 to 9.66μg/day with an average of 7.44μg/day over a treatment period of 95 to 324 days.

83-002313 Nagy, A.; Z. Monostory and V. Csányi. RAPID DEVELOPMENT OF THE CLONAL STATE IN SUCCESSIVE GYNOGENETIC GENERATIONS OF CARP *(CYPRINUS CARPIO)*. *Copeia* 1983(3):745-749. 1983. SFA 28(4)
[Lab. Behav. Genet., L. Eötvös Univ., 2131 Göd, Hungary] Rapid development of the clonal state in the successive gynogenetic carp generations was demonstrated using tissue transplantation. The higher the number of genogenetic generations, the longer were the survival times of the allografts. In the fourth gynogenetic generation, the lack of allograft rejection or pigment cell destruction within the test period clearly shows the high level of isogenity in this generation. By altering the paternal contribution in goldfish, we showed the sensitivity of tissue transplantation to genetic diversity in a population.

83-002314 Onozato, H. and E. Yamaha. [INDUCTION OF GYNOGENESIS WITH ULTRAVOIOLET RAYS IN FOUR SPECIES OF SALMONIFORMES.] *Bull. Jpn. Soc. Sci. Fish.* 49(5):693-699. May 1983. In Japanese with English summ. SFA 28(4)
[Fac. Fish., Hokkaido Univ., Hakodate 041, Japan]

83-002315 Polyarush, V. P. [INTRASPECITIC HYBRIDIZATION OF HERBIVOROUS FISHES.] *Proc. All-Union Meet. Genet. Sel. Breed. Hybridization Fish.* 2:103-107. 1983. In Russian with English summ. SFA 28(4)

83-002316 Rukhkyan, R. G. [CHROMOSOME POLYMORPHISM IN TROUT IN ARMENIA.] *Proc. All-Union Meet. Genet. Sel. Breed. Hybridization Fish.* 2:69-72. 1983. In Russian with English summ. SFA 28(4)

83-002317 Salmenkova, E. A. and V. T. Omel'chenko. [GENETIC ANALYSIS OF SOME POLYMORPHIC ENZYME SYSTEMS IN PINK SALMON *ONCORHYNCHUS GORBUSCHA* (WALB.).] *Proc. All-Union Meet. Genet. Sel. Breed. Hybridization Fish.* 2:8-15. 1983. In Russian with English summ. SFA 28(4)

83-002318 Serebraykova, E. V.; V. A. Aref'ev; V. A. Vasil'ev and L. I. Sokolov. [THE STUDY OF THE KARYOTYPE OF GIANT STURGEON WITH REFERENCE TO THEIR SYSTEMATIC POSITION.] *Proc. All-Union Meet. Genet. Sel. Breed. Hybridization Fish.* 2:63-69. In Russian with English summ. SFA 28(4)

83-002319 Shaklee, J. B.; R. W. Brill and R. Acerra. BIOCHEMICAL GENETICS OF PACIFIC BLUE MARLIN, *MAKAIRA NIGRICANS*, FROM HAWAIIAN WATER. *NOAA Fish. Bull.* 81(1):85-90. Jan. 1983. SFA 28(4)
[Div. Fish. Res., CSIRO Mar. Lab., 233 Middle Street, Cleveland, Queensland 4163, Australia]

83-002320 Sidorov, V. S.; E. I. Lizenko and Z. A. Nefedova. [GENETIC STABILITY OF RATIOS BETWEEN INDIVIDUAL CLASSES OF PHOSPHOLIPIDS FROM MATURE SEXUAL PRODUCTS OF FRESHWATER FISH.] *Proc. All-Union Meet. Genet. Sel. Breed. Hybridization Fish.* 2:47-53. 1983. In Russian with English summ. SFA 28(4)

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

83-002321 Steffens, W.; H. Jähnichen and F. Fredrich. ERFOLGREICHE VERMEHRUNG VON HAUSEN X STERLET-HYBRIDEN (*HUSO HUSO* ♀ X *ACIPENSER RUTHENUS* ♂) (PISCES, ACIPENSERIDAE). [SUCCESSFUL PROPAGATION OF THE HYBRID BELUGA X STERLET (*HUSO HUSO* ♀ X *ACIPENSER RUTHENUS* ♂) (PISCES, ACIPENSERIDAE).] *Zool. Anz.* 211(1/2):55-64. 1983. In German with English summ. SFA 28(4)
[Inst. Binnenfisch., Berlin, West Germany]

83-002322 Thorgaard, G. H. CHROMOSOMAL DIFFERENCES AMONG RAINBOW TROUT POPULATIONS. *Copeia* 1983(3):650-662. 1983. SFA 28(4)
[Prog. Genet. Cell Biol., Wash. State Univ., Pullman 99164]

83-002323 Turner, B. J.; T. A. Grudzien; K. P. Adkisson and M. M. White. EVOLUTIONARY GENETICS OF TROPHIC DIFFERENTIATION IN GOODEID FISHES OF THE GENUS *ILYODON*. *Environ. Biol. Fishes* 9(2):159-172. 1 Sept. 1983. SFA 28(4)
[Dep. Biol., VPI & SU, Blacksburg, VA 24061]

83-002324 Van Beneden, R. J. THE GLUCOSEPHOSPHATE ISOMERASE SYSTEM OF THE TELEOST *FUNDULUS HETEROCLITUS* (L.): ISOLATION, KINETIC CHARACTERIZATION AND METABOLIC ROLES OF THE MULTILOCUS AND THE ALLELIC ISOZYMES. *Ph.D. dissertation, Johns Hopkins Univ.* 181p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(3):683. Sept. 1983. SFA 28(4)

83-002325 Whitmore, D. H. INTROGRESSIVE HYBRIDIZATION OF SMALLMOUTH BASS (*MICROPTERUS DOLOMIEUI*) AND GUADALUPE BASS (*M. TRECULI*). *Copeia* 1983(3):672-679. 1983. SFA 28(4)
[Dep. Biol., Univ. Tex., Arlington 76019] The introduction of smallmouth bass (*Micropterus dolomieui*) into the range of the endemic Guadalupe bass (*M. treculi*) on the Edwards Plateau in southcentral Texas has resulted in hybridization between these species. Sympatric populations of smallmouth bass and Guadalupe bass from two discrete locations on the Edwards Plateau were analyzed on the basis of biochemical genetics and meristics. Electrophoretic and meristic evidence revealed no interspecific hybrids in Lake Travis. It apperas that smallmouth bass have not adapted well in this lake, perhaps contributing to the lack of genetic exchange with Guadalupe bass. In contrast, the Canyon Lake populations are actively interbreeding, and diagnostic allozyme loci clearly revealed genetic introgression between these two species. Genetic analysis proved to be a more sensitive tool for detecting F_2 or backcross individuals than the mersitic index. The genetic integrity of Guadalupe bass appears to be seriously threatened in at least part of its highly restricted range.

83-002326 Wiggins, T. A.; T. R. Bender, Jr.; V. A. Mudrak and M. A. Takacs. HYBRIDIZATION OF YELLOW PERCH AND WALLEYE. *Prog. Fish-Cult.* 45(2):131-132. Apr. 1983. SFA 28(4)
[Pa. Fish. Comm., Benner Spring Fish Res. Stn., Bellefonte 16823]

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83-002327 Bakker, T. C. M. and P. Sevenster. DETERMINANTS OF DOMINANCE IN MALE STICKLEBACKS (*GASTEROSTEUS ACULEATUS* L.). *Behaviour* 86(1-2):55-71. 1983. SFA 28(4)
[Dep. Ethol., Zool. Lab., Univ. Leiden, Netherlands]

BEHAVIOR (CONTINUED)

83-002328 Bingzheng, L.; H. Songfang and L. Jiwu. [THE POPULATION STRUCTURE OF THE HAIRTAILS, *TRICHIURUS HAUMELA* (PISCES, TRICHIURIDAE) AND ITS PECULIARITIES.] *Oceanol. Limnol. Sin.* 14(2):148-159. 1983. In Chinese with English summ. SFA 28(4)
[Inst. Oceanol., Acad. Sin., China]

83-002329 Bulkley, R. V. and R. Pimentel. TEMPERATURE PREFERENCE AND AVOIDANCE BY ADULT RAZORBACK SUCKERS. *Trans. Am. Fish. Soc.* 112(5):601-607. Sept. 1983. SFA 28(4)
[Utah Coop. Fish. Res. Unit, Utah State Univ., Logan 84322]

83-002330 Courtenay, S. C. and M. H. A. Keenleyside. WRIGGLER-HANGING: A RESPONSE TO HYPOXIA BY BROOD-REARING *HEROTILAPIA MULTISPINOSA* (TELEOSTEI, CICHLIDAE). *Behaviour* 85(3-4):183-197. 1983. In English with French summ. SFA 28(4)
[Dep. Zool., Univ. West. Ontario, London, ON, Canada]

83-002331 Denight, M. L. and J. A. Ward. RELATIONSHIP OF CHIN SPOT SIZE TO DOMINANCE IN THE BLACK-CHINNED MOUTHBROODING CICHLID FISH (*SAROTHERODON MELANOTHERON*). *Anim. Behav.* 30(4):1099-1104. Nov. 1982. SFA 28(4)
[Ill. State Univ., Normal 61761]

83-002332 Douglas, R. H. SPECTRAL SENSITIVITY OF RAINBOW TROUT (*SALMO GAIRDNERI*). *Rev. Can. Biol. Exp.* 42(2):117-122. July 1983. SFA 28(4)
[Ethol. & Neural Physiol. Group, Sch. Biol., Univ. Sussex, Brighton, Sussex, England]

83-002333 Figler, M. H. and D. M. Einhorn. THE TERRITORIAL PRIOR RESIDENCE EFFECT IN CONVICT CICHLIDS (*CICHLASOMA NIGROFASCIATUM* GÜNTHER): TEMPORAL ASPECTS OF ESTABLISHMENT AND RETENTION, AND PROXIMATE MECHANISMS. *Behaviour* 85(1-2):157-183. 1983. SFA 28(4)
[Dep. Psychol., Towson State Univ., Towson, MD]

83-002334 Francis, R. C. EXPERIENTIAL EFFECTS ON AGONISTIC BEHAVIOR IN THE PARADISE FISH, *MACROPODUS OPERCULARIS*. *Behaviour* 85(3-4):292-313. 1983. In English with German summ. SFA 28(4)
[Dep. Ecol. Evol., State Univ. N. Y., Stony Brook 11794]

83-002335 Freeman, S. and W. Alevizon. ASPECTS OF TERRITORIAL BEHAVIOR AND HABITAT DISTRIBUTION OF THE FAIRY BASSLET *GRAMMA LORETO*. *Copeia* 1983(3):829-832. 1983. SFA 28(4)
[Dep. Biol. Sci., Fla. Inst. Technol., Melbourne 32901]

83-002336 Gibson, R. J. WATER VELOCITY AS A FACTOR IN THE CHANGE FROM AGGRESSIVE TO SCHOOLING BEHAVIOUR AND SUBSEQUENT MIGRATION OF ATLANTIC SALMON SMOLT (*SALMO SALAR*). *Nat. Can. (Que.)* 110(2):143-148. 1983. In English with French summ. SFA 28(4)
[Dep. Fish. Oceans, P.O. Box 5667, St. John's, NF A1C 5X1, Canada] The agonistic behaviour of smolts was compared with that of parr in stream tanks over the normal migration time of the smolts. Smolts had similar agonistic behaviour to that of the parr. There was no migratory behaviour observed, and smolts remained as aggressive as the parr. Diminished aggression appears not

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83-002336 CONTINUED to be responsible for the downriver migration of smolts, and the change from territorial to schooling behaviour observed in natural conditions is likely due to the change in buoyancy and the associated change in preferred water velocity.

83-002337 Gore, M. A. THE EFFECT OF A FLEXIBLE SPACING SYSTEM ON THE SOCIAL ORGANIZATION OF A CORAL REEF FISH, *CHAETODON CAPISTRATUS*. *Behaviour* 85(1-2):118-145. 1983. SFA 28(4)
[Ethol. Wildforsch., Univ. Zürich, Birchstr. 95, 8050 Zürich, Switzerland]

83-002338 Hailman, J. P. A TEST OF SYMMETRY-DECEPTION IN A CHAETODONTID FISH. *Anim. Behav.* 29(4):1267. Nov. 1981. SFA 28(4)
[Dep. Zool., Univ. Wis., Madison 53706]

83-002339 Harada, K. STATISTICAL APPROACH TO FINDING PROBABLE FEEDING ATTRACTANTS FOR ORIENTAL WEATHERFISH. *Bull. Jpn. Soc. Sci. Fish.* 49(4):521-526. Apr. 1983. SFA 28(4)
[Lab. Biochem., Dep. Food Sci. Technol., Shimonoseki Univ. Fish., Shimonoseki 759-65, Japan]

83-002340 Kawamura, G. and T. Shimowada. [RETINOMOTOR RESPONSE AND CHANGE IN SHAPE DISCRIMINATION OF JAPANESE PARROTFISH DURING LIGHT ADAPTATION.] *Bull. Jpn. Soc. Sci. Fish.* 49(7):1025-1028. July 1983. In Japanese with English summ. SFA 28(4)
[Fac. Fish., Kagoshima Univ., 4-50-20 Shimoarata, Kagoshima 890, Japan] To obtain a fundamental knowledge regarding the vision of fishes attracted to fish lamp, the retinomotor response and change in shape discrimination during light adaptation of the Japanese parrotfish *Oplegnathus fasciatus* (TEMMINCK and SCHLEGEL) were examined. The histological observation showed that the retina at five minutes after the onset of light was still dark adapted and remarkable change in the thickness of pigment and cones took place between 5 and 10 minutes, but the retina was not light adapted at this time. The fish which was pretrained to discriminated shapes displayed in a tank, discriminated the simplest shape within 5 minutes and all other shapes used in the experiment within 10 minutes after the onset of light. From the results obtained, it is presumed that fishes attracted to fish lamp can recognize to a great extent the shape of fishing gear because of a possible neural adaptation mechanism even if their retina is not light adapted histologically.

83-002341 Klimley, A. P. SOCIAL ORGANIZATION OF SCHOOLS OF THE SCALLOPED HAMMERHEAD SHARK, *SPHYRNA LEWINI* (GRIFFITH AND SMITH), IN THE GULF OF CALIFORNIA. *Ph.D. dissertation, Univ. Calif. (San Diego)* 358p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(1):33. July 1983. SFA 28(4)
The social behavior of the scalloped hammerhead shark is described with an emphasis on determining the function of its polarized schooling. This shark possesses a refuging social system in which individuals remain in groups in a small core of their home range during the inactive phase of their diel cycle and disperse into the surrounding environment during the active phase. Scalloped hammerhead sharks, followed by ultrasonic telemetry, swam slowly back and forth during the day along the ridge of seamount, El Bajo Espiritu Santo. These sharks moved rapidly away from the seamount late during the day

BEHAVIOR (CONTINUED)

83-002341 CONTINUED or at dusk. The rhythmical dispersal and return of the sharks to the seamount was indicated by the return of telemetered sharks followed away from the seamount and the repeated observation of marked sharks at the seamount over periods up to seven weeks. At the seamount during the day the sharks can interact socially while remaining centrally positioned within their feeding arena. They are then ensured of foraging success at night. The diet of hammerheads consisted of cephalopods, fishes, and crustaceans. The large schools were formed of sharks spanning a size range of 88 to 371 cm. This permitted size segregation within the schools. Both the total lengths and distances to the nearest neighbors increased significantly toward the bottoms of groups at the insular site, Las Arenitas. Total lengths increased in a direction into the groups at the seamount sites, El Bajo Espiritu Santo and Gorda. The sizes and spatial relations of school members were measured from stereophotographs taken by free-diving to the edges of the schools. The presence of larger female sharks at the bottoms of groups at Las Arenitas is believed to be caused by aggressive interactions among the females of which the schools were primarily composed. The sharks within the schools were mostely immature. The onset of maturity in male hammerhead occurred at 163 cm, that of females at 217 cm.

83-002342 Knopf, R. R. DIEL ACTIVITY, HABITAT OBSERVATIONS AND THE EFFECTS OF LIGHT INTENSITY ON RADIOTAGGED LARGEMOUTH BASS. *M.A. thesis, Cent. Mich. Univ.* 136p. 1982. Abstract only. From Masters Abstr. 21(3):222. Sept. 1983. SFA 28(4)

Eight largemouth bass surgically implanted with radiotransmitters provided location and movement data in a 256 ha Michigan impoundment during the summers of 1979 and 1980. SCUBA observations, observations during lake drawdown and sonagraphic recordings determined the topographical features with which largemouth bass were more commonly associated. Largemouth bass were classified according to their behavior and diel activity as either deep water, structure-oriented (DWSO) or shallow water, weed-oriented (SWWO). SWWO bass were further classified as nomadic or non-nomadic. When largemouth bass changed lake locations or moved to or from day/night areas they usually followed dropoffs. Deep water largemouth bass habitat is characteristically located on a dropoff which provides access to shallow water food shelf areas and contains cover. Light intensity may limit largemouth bass depth distribution, but does not appear to regulate it. Surgical implant of transmitters significantly influenced largemouth bass behavior.

83-002343 Kroll, W. THE ROLE OF BEHAVIORAL AND MORPHOLOGICAL DEVELOPMENT IN THE LIFE HISTORY OF *APHYOSEMION GARDNERI* (BOULENGER). *Ph.D. dissertation, Indiana Univ.* 84p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(3):692. Sept. 1983. SFA 28(4)

83-002344 Losey, G. S., Jr. EXPERIENCE LEADS TO ATTACK OF NOVEL SPECIES BY AN INTERSPECIFIC TERRITORIAL DAMSELFISH, *EUPOMACENTRUS FASCIOLATUS*. *Anim. Behav.* 29(4):1271-1272. Nov. 1981. SFA 28(4)

[Dep. Zool., Univ. Hawaii, Box 1346, Kaneohe 96744]

83-002345 Lucas, J. R. and K. A. Benkert. VARIABLE FORAGING AND CLEANING BEHAVIOR BY JUVENILE LEATHERJACKETS, *OLIGOPLITES SAURUS* (CARANGIDAE). *Estuaries* 6(3):247-250. Sept. 1983. SFA 28(4)

[Dep. Zool., Univ. Fla., Gainesville 32611] The behavior of the leatherjack, *Oligoplites saurus*, was studied in the field. Four behavioral patterns were identified: (1) cleaning behavior on the redfin needlefish, *Strongylura notata*, (2) intraspecific schooling, (3) interspecific schooling with the rough and tidewater silversides, *Membras martinica* and *Menidia peninsulae*, pinfish, *Lagodon rhomboides*, and

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83-002345 CONTINUED menhaden, *Brevoortia* sp., (4) swimming along in a "leaf-mimic" position or next to floating algae or debris. Fishes exhibiting any of these behaviors fed primarily on plankton. Schooling leatherjackets also fed on scales of *Strongylurus notata*, *Brevoortia* sp., *Menidia peninsulae* and *Lagodon rhomboides*. These observations are supported by stomach content analyses. It is suggested that scale-feeding may be a preadaptation for cleaning behavior among leatherjackets.

83-002346 Moller, P.; J. Serrier; A. Squire and M. Boudinot. SOCIAL SPACING IN THE MORMYRID FISH *GNATHONEMUS PETERSII* (PISCES): A MULTISENSORY APPROACH. *Anim. Behav.* 30(3):641-650. Aug. 1982. SFA 28(4)
[Hunter Coll., New York, NY 10021]

83-002347 Ohta, Y.; T. Umehara and A. Tsuchiya. [A NEW DEVICE FOR SWIMMING FISH POSITION DETECTION ON TV MONITOR--ANALYTICAL METHODS OF FISH BEHAVIOR BY MAN-MADE UNDERWATER SOUND.] *J. Fac. Mar. Sci. Technol. Tokai Univ.* No. 16. p.127-138. 1983. In Japanese with English summ. SFA 28(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan 424]

83-002348 Peeke, H. V. S.; M. H. Figler and N. Blankenship. RETENTION AND RECOVERY OF HABITUATED TERRITORIAL AGGRESSIVE BEHAVIOR IN THE THREE-SPINED STICKLEBACK (*GASTEROSTEUS ACULEATUS* L.): THE ROLES OF TIME AND NEST RECONSTRUCTION. *Behaviour* 69(3-4):171-182. 1979. In English with German summ. SFA 28(4)
[Lab. Psychobiol., Dep. Psychiatry, Univ. Calif., San Francisco]

83-002349 Pitcher, T. J.; C. J. Wyche and A. E. Magurran. EVIDENCE FOR POSITION PREFERENCES IN SCHOOLING MACKEREL. *Anim. Behav.* 30(3):932-934. Aug. 1982. SFA 28(4)
[Sch. Anim. Biol., Univ. Coll. North Wales, Bangor, Gywnedd LL57 2UW, Wales]

83-002350 Quinn, T. P. and C. Groot. ORIENTATION OF CHUM SALMON (*ONCORHYNCHUS KETA*) AFTER INTERNAL AND EXTERNAL MAGNETIC FIELD ALTERATION. *Can. J. Fish. Aquatic Sci.* 40(10):1598-1606. Oct. 1983. In English with French summ. SFA 28(4)
[Pac. Biol. Stn., Nanaimmo, BC V9R 5K6, Canada]

83-002351 Rahmann, H.; G. Jeserich and I. Zeutzius. ONTOGENY OF VISUAL ACUITY OF RAINBOW TROUT UNDER NORMAL CONDITIONS AND LIGHT DEPRIVATION. *Behaviour* 68(3-4):315-322. 1979. In English with German summ. SFA 28(4)
[Inst. Zool., Univ. Stuttgart-Hohenheim, West Germany] The development of visual acuity (minimum separable visual angle) in rainbow trout (*Salmo gairdneri*) was investigated from hatching to one year old trout by eliciting optomotor reactions in an optokinetic drum. 1. The first optomotor responses were found 10 days after hatching with a visual angle of 30° of arc. Then a rapid increase in the visual resolving power occurs leading to a visual angle of about 1° at the end of the larval period. Up to the age of one year the visual angle of rainbow trout improves slightly to final 14' of arc. 2. Light deprivation during rearing causes a severe impairment of visual acuity during the first 40 days after hatching (best visual angle only 2°05' of arc). 3. The results are discussed with respect to synaptogenetical and biochemical findings in the tectum opticum of rainbow trout under the same rearing conditions.

BEHAVIOR (CONTINUED)

83-002352 Ribbink, A. J.; B. A. Marsh; A. C. Marsh; A. C. Ribbink and B. J. Sharp. A PRELIMINARY SURVEY OF THE CICHLID FISHES OF ROCKY HABITATS IN LAKE MALAWI. *S. Afr. J. Zool.* 18(3):149-310. Aug. 1983. In English with Afrikaans summ. SFA 28(4)
[J.L.B. Smith Inst. Ichthyol., P.B. 1015, Grahamstown, 6140 South Africa]

83-002353 Rimmer, D. M.; U. Paim and R. L. Saunders. AUTUMNAL HABITAT SHIFT OF JUVENILE ATLANTIC SALMON (*SALMO SALAR*) IN A SMALL RIVER. *Can. J. Fish. Aquatic Sci.* 40(6):671-680. June 1983. In English with French summ. SFA 28(4)
[Fish. Br., Dep. Energy Nat. Resour., 8th Floor, 9915 108 Street, Edmonton, AB T5K 2C9, Canada]

83-002354 Sakamoto, W. and R. Tsuda. STATISTICAL ANALYSES OF SWIMMING MODE OF LARVAE *PAGRUS MAJOR*. *Bull. Jpn. Soc. Sci. Fish.* 49(6):839-848. June 1983. SFA 28(4)
[Fac. Agric., Kyoto Univ., Kitashirakawa Oiwakecho, Kyoto 606, Japan] Statistical analyses of speed, velocity and progressive angular deviation of red sea bream larvae were carried out to determine the propriety of the random walking theory in relation to swimming motion. The moving momentum consumed during the period of movement increased when an individual moved at random and this condition appeared disadvantageous to the fish, especially for the larvae. At times however, we observed that swimming motion resembled the quasi-random walking process. This phenomenon has given rise to some physical and biological factors; one is the balance between thrust power and total viscous fluid drag and another is searching for food or the feeding process.

83-002355 Sazima, I. SCALE-EATING IN CHARACOIDS AND OTHER FISHES. *Environ. Biol. Fishes* 9(2):87-101. 1 Sept. 1983. SFA 28(4)
[Dep. Zool., Univ. Estadual Campinas, 13100 Campinas, Sao Paulo, Brazil] Scale-eating is known for several unrelated fish groups, but few data are available on the habits of most species. General habits and feeding behavior of some lepidophagous characoids are presented and compared to other scale-eating species. The diversity of morphology, habits, and behavior of scale-eating fishes is great, and few patterns are shared by the specialized scale-eaters. Except for modified teeth, no morphological characteristic permits identifying a fish as a specialized lepidophage. Hunting tactics consist mainly of ambush, stalking, or disguise (aggressive mimicry). Scale-removal may be accomplished by a jarring strike with the snout, generally directed at the prey's flank, or by biting or rasping. The mode of scale-removal seems to reflect primarily the disposition of the jaws and the teeth. Scales are swallowed directly if taken in the mouth; if not, they are gathered as they sink, or picked up from the bottom. Scale-eating is probably a size-limited habit. Specialized scale-eaters rarely exceed 200 mm, most ranging near 120 mm. Some species eat scales only when young; most take other food items in addition to scales. Scale-eating habits probably arose from trophic or social behaviors. These are not mutually exclusive and, indeed, may have acted together during the evolution of lepidophagy. Suggested trophic origins include scraping epilithic algae, modified piscivory, and necrophagy. Social origins include intra- and interspecific aggressive behavior during feeding.

83-002356 Segaar, J.; J. P. C. DeBruin; A. P. Van der Meché and M. E. Van der Meché-Jacobi. INFLUENCE OF CHEMICAL RECEPTIVITY ON REPRODUCTIVE BEHAVIOUR OF THE MALE THREE-SPINED STICKLEBACK (*GASTEROSTEUS*

BEHAVIOR (CONTINUED)

83-002356 CONTINUED *ACULEATUS* L.). AN ETHOLOGICAL ANALYSIS OF CRANIAL NERVE FUNCTIONS REGARDING NEST FANNING ACTIVITY AND THE ZIGZAG DANCE. *Behaviour* 86(1-2):100-166. 1983. In English with German summ. SFA 28(4)
[Neth. Inst. Brain Res., Amsterdam, Netherlands]

83-002357 Seigel, J. A. and T. A. Adamson. BATESIAN MIMICRY BETWEEN A CARDINALFISH (APOGONIDAE) AND A VENOMOUS SCORPIONFISH (SCORPAENIDAE) FROM THE PHILLIPINE ISLANDS. *Pac. Sci.* 37(1):75-79. Jan. 1983. SFA 28(4)
[Nat. Hist. Mus. Los Angeles Cty., Sect. Fish., 900 Exposition Blvd., Los Angeles, CA 90007] An apparent case of Batesian mimicry involving the cardinalfish *Fowleria* sp. and the venomous scorpionfish *Scorpaenodes guamensis* is described. Classical definitions of Batesian systems require that the mimic be less common than the model. The present data do not suggest a classical Batesian mimetic system. However, if the model is considered to be the generalized scorpaenid morph characteristic of *S. guamensis* and the other Philippine scorpaenids, then the mimetic association between *Fowleria* sp. and *Scorpaenodes guamensis* is a classical Batesian system.

83-002358 Squire, A. and P. Moller. EFFECTS OF WATER CONDUCTIVITY ON ELECTROCOMMUNICATION IN THE WEAK-ELECTRIC FISH *BRIENOMYRUS NIGER* (MORMYRIFORMES). *Anim. Behav.* 39(2):375-382. May 1982. SFA 28(4)
[P. Moller: Am. Mus. Nat. Hist., Central Park West at 79th Street, New York 10024]

83-002359 Thompson, S. HOMING IN A TERRITORIAL REEF FISH. *Copeia* 1983(3):832-834. 1983. SFA 28(4)
[Zool. Dep., Univ. Melbourne, Parkville, Melbourne, Victoria 3052, Australia]

83-002360 Thresher, R. E. HABITAT EFFECTS ON REPRODUCTIVE SUCCESS IN THE CORAL REEF FISH, *ACANTHOCHROMIS POLYACANTHUS* (POMACENTRIDAE). *Ecology* 64(5):1184-1199. Oct. 1983. SFA 28(4)
[Commonwealth Sch. Indus. Res. Organ., Div. Fish. Res., P.O. Box 21, Cronulla, NWS 2230, Australia]

83-002361 Tsuda, T. and W. Sakamoto. ANALYSIS OF CHANGES IN SWIMMING MODES DURING THE GROWTH OF YOLK-SAC LARVAE *PAGRUS MAJOR*. *Bull. Jpn. Soc. Sci. Fish.* 49(6):829-837. June 1983. SFA 28(4)
[Fac. Agric., Kinki Univ., Kowakae Higashi-Osaka, Osaka 577, Japan] Visual observations were made of the changes in swimming modes of the red sea bream *Pagrus major* from hatching to the end of the yolk-sac period. The aspect of motion changed with time and the swimming mode was classified into three groups. The mode of pre-larvae approximately 24 hours after hatching was especially seen to have a regularity in movement. The spectral density of speed of group I was particularly low and no rhythmical motion was observed. On the other hand, groups II and III had their peaks at 30 min and 13 min respectively. It was considered that the difference in these values was due to change in momentum. It is obvious that the power spectral analysis method was useful in determining the larvae motion.

BEHAVIOR (CONTINUED)

83-002362 Turnpenny, A. W. H. SWIMMING PERFORMANCE OF JUVENILE SPRAT, *SPRATTUS SPRATTUS* L., AND HERRING, *CLUPEA HARENGUS* L., AT DIFFERENT SALINITIES. *J. Fish Biol.* 23(3):321-325. Sept. 1983. SFA 28(4)

[Cent. Elec. Res. Lab., Mar. Biol. Unit, Fawley, Southampton SO4 1TW, England] Sustained swimming performance of juvenile sprat, *S. sprattus* (29-48 mm S.L.), and herring, *C. harengus* (46-58 mm) was measured in a laboratory flume over a range of salinities from 18 to 33 ^{o}/oo at water temperatures of 16-19° C. Critical swimming speeds (CSS) of both species, relative to body length, were similar, averaging 10-12 body lengths per second (bl s^{-1}). There was no apparent relationship with salinity. These swimming speeds are higher than values generally quoted in the literature for sustained swimming of sprat and herring (2-7 bl s^{-1}) and it is concluded that the better performance found in this study was a function of improved fish handling techniques, and of the size of fish used since most other studies have dealt with larger, commercial sized fish.

83-002363 Turnpenny, A. W. H. and R. N. Bamber. THE CRITICAL SWIMMING SPEED OF THE SAND SMELT (*ATHERINA PRESBYTER* CUVIER) IN RELATION TO CAPTURE AT A POWER STATION COOLING WATER INTAKE. *J. Fish Biol.* 23(1):65-73. July 1983. SFA 28(4)

[Mar. Biol. Unit., Fawley Power Station, Fawley, Southampton SO4 1TW, England] Critical swimming speeds (CSS) of sand smelt, *Atherina presbyter*, were measured in a laboratory flume. Individuals of all age classes (0+ to III+) found in the vicinity of Fawley power station, Hampshire, were tested at temperatures covering the seasonal range. The median CSS was 2.7 body lengths per second (bl s^{-1}) at 5.8°C, rising to 5.7 bl s^{-1} at 18.5°C. A two-variable (water temperature and body length) regression model was fitted to the data, and this was used to assess escape potential of fish coming into contact with the power station cooling water intake currents and the extent of possible bias in fish length data collected from this source. It is concluded that the sand smelt remains vulnerable to entrainment at the power station over its whole length range and over the full range of seasonal temperatures and that size-dependent swimming performance will not lead to significant bias in sample length distributions.

83-002364 Tytler, P. and T. Vaughan. THERMAL ECOLOGY OF THE MUDSKIPPERS, *PERIOPHTHALMUS KOELREUTERI* (PALLAS) AND *BOLEOPHTHALMUS BODDARTI* (PALLAS) OF KUWAIT BAY. *J. Fish Biol.* 23(3):327-337. Sept. 1983. SFA 28(4)

[Biol. Dep., Univ. Stirling, England] The annual range of body temperatures (14-35° C) of emergent mudskippers are substantially less than that of air temperatures (10-42° C) as a result of behavioural thermoregulation. In winter, low surface temperatures are avoided by remaining in burrows. Newly emerged mudskippers then bask until body temperatures rise above 14° C before they move onto the mud. In summer, body temperatures are kept lower than ambient by selecting areas where evaporative cooling is high. Body temperatures generally match those of wet mud, which can be 7° C lower than air shade temperatures. The smaller, more terrestrial, *Periophthalmus koelreuteri* have body temperatures which are mainly lower in summer and higher in winter than *Boleophthalmus boddarti*.

83-002365 Webb, P. W. and R. S. Keyes. SWIMMING KINEMATICS OF SHARKS. *NOAA Fish. Bull.* 80(4):803-812. Oct. 1982. SFA 28(4)

[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109]

83-002366 Wieland, W. INTERACTIVE LIFE HOSTORIES OF THREE SPECIES OF *PERCINA* (PISCES: PERCIDAE) IN THE ALABMA RIVER SYSTEM. *Ph.D. dissertation, Auburn Univ.* 146p. 1983. From Diss. Abstr. Int. B Sci. Eng.

BEHAVIOR (CONTINUED)

83-002366 CONTINUED 44(3):722. Sept. 1983. SFA 28(4)
The natural histories of *Percina* sp. cf. *P. macrocephala*, *P. nigrofasciata*, and *P. palmaris* were examined. This is the first report on the life histories of *Percina* sp. and *P. palmaris*. *Percina* sp. and *P. palmaris* are more specialized in their habitat requirements than *P. nigreofasciata*. *Percina palmaris* was most common and largest in swift current among cover. *Percina* sp. was obtained with the most consistent success by seining below riffles, in runs and pools, with moderate current. *Percina nigrofasciata* was taken in a variety of habitats, including shallow riffles, shallow and deep runs with slow or fast current, runs at the head or tail of riffles, and even in pools, usually around snags or debris. Spawning occurred in the spring and overlapped between the three species. Individuals of all species entered the spawning population at age 1+. The oldest specimens of *P. palmaris* and *P. nigrofasciata* found were age 3+. No. *Percina* sp. over age 2+ were taken. These species were opportunistic sight feeders with diets consisting almost exclusively of immature aquatic insects. Segregation in diet was based on differences in peak fedding time and method of feeding. *Percina nigrofasciata* had the the greatest niche breadth based on reproduction, habitat preferences, and food habits. *Percina* sp. is the most specialized, having the lowest fecundity, least diverse diet, and smallest range. Interactions with respect to reproduction, food habits, and habitat preferences is presumed to affect habitat utilization of these species. Evidence that *P. nigrofasciata* is displaced from riffles by *P. palmaris* is presented for syntopic populations. A significant difference in growth is present between allopatric and syntopic populations of *P. nigrofasciata* and *P. palmaris*. Interactions resulted in changes in habitat utilization and are believed to play a role in the distribution of these three species.

LIFE HISTORY-GENERAL WORKS

83-002367 Bailey, K. M. THE EARLY LIFE HISTORY OF THE PACIFIC HAKE, *MERLUCCIUS PRODUCTUS*. *NOAA Fish. Bull.* 80(3):589-598. July 1982. SFA 28(4)
[Coll. Fish., Univ. Wash., Seattle 98195] The early life history of Pacific hake, *Merluccius productus*, is described from laboratory and field studies. At ambient temperatures (11°-13°C) egg hatching takes about 100-120 hours; complete absorption of the yolk takes about 150-200 hours. Respiration rates for first feeding larvae at 12°C are 4.8-6.8µl/mg per hour. Growth rates for at least the first 20 days are slow compared with other larvae in the California Current. First-feeding hake larvae require a daily ingestion of about 0.13 calories.

83-002368 Baltz, D. M. and E. E. Knight. AGE, GROWTH, REPRODUCTIVE CHARACTERISTICS, AND SEASONAL DEPTH DISTRIBUTION OF THE SPOTFIN SURFPERCH, *HYPERPROSOPON ANALE*. *Calif. Fish Game* 69(2):97-104. Apr. 1983. SFA 28(4)
[Dep. Wildl. Fish. Biol., Univ. Calif., Davis 95616] Life history information, based on an analysis of museum material, on the age, growth, reproductive characteristics, and seasonal depth distribution of the spotfin surfperch is presented. Females attain mean standard lengths (SL) of 103 mm at age one, 116mm at age two, and 121 mm at age three. Males grow more slowly. All females produce their first brood at age one. Brood size varies from 4 to 20. Brood size, size of young, and brood wet weight all increase significantly with length of female. The regression of brood size on age is significant; moreover, when used with length, age contributes to the

LIFE HISTORY-GENERAL WORKS (CONTINUED)

83-002368 CONTINUED prediction of brood size by multiple regression. Spotfin surfperch occurr in offshore waters (depths of 15-64 m) during most of the year but in summer months females migrate inshore and give birth in shallow waters.

83-002369 Bath, D. W. and J. M. O'Connor. THE BIOLOGY OF THE WHITE PERCH, *MORONE AMERICANA*, IN THE HUDSON RIVER ESTUARY. *NOAA Fish. Bull.* 80(3):599-610. July 1982. SFA 28(4)
[N.Y. Univ. Med. Cent., Dep. Environ. Med., Lab. Environ. Stud., 550 First Ave., New York 10016] White perch, *Morone americana*, are found throughout a 250 km region in the Hudson River from Manhattan north to Albany, New York. They represent a dominant species in most portions of the river, although they are of little importance in the commercial fishery. Life history information was determined for more than 7,500 white perch collected from a 15 km region of the Hudson River between Haverstraw and Bear Mountain, New York. Annulus formation began by the first week in May and was completed by the end of July. Maximum age for both male and female white perch was 7 years. Most of the growth occurred in the first 3 years for both males and females, and represented 78% of the length attained by the seventh year. Most fish were sexually mature by their second year. The length-weight relationship observed for Hudson River white perch was Log W=-4.743 + 3.093 Log L. The mean fecundity was 50,678 eggs per female, with a range of 15,726-161,449.

83-002370 Bond, C. E.; T. T. Kan and K. W. Myers. NOTES ON THE MARINE LIFE OF THE RIVER LAMPREY, *LAMPETRA AYRESI*, IN YAQUINA BAY, OREGON, AND THE COLUMBIA RIVER ESTUARY. *NOAA Fish. Bull.* 81(1):165-167. Jan. 1983. SFA 28(4)
[Dep. Fish. Wildl., Oreg. State Univ., Corvallis 97331]

83-002371 Darovec, J. E., Jr. SCIAENID FISHES (OSTEICHTHYES: PERCIFORMES) OF WESTERN PENINSULAR FLORIDA. *Mem. Hourglass Cruises* 6(3):1-73. May 1983. SFA 28(4)
[Fla. Dep. Nat. Resour. Mar. Res. Lab., 100 Eighth Ave. S.E., St. Petersburg 33701-5095]

83-002372 Edwards, E. A.; H. Li and C. B. Schreck. HABITAT SUITABILITY INDEX MODELS: LONGNOSE DACE. *U.S. Fish Wildl. Serv.* FWS/OBS-82/10.33. v + 13p. Apr. 1983.
[U.S. FWS, 2627 Redwing Rd., Fort Collins, CO 80526]

83-002373 Frank, K. T. and W. C. Leggett. SURVIVAL VALUE OF AN OPPORTUNISTIC LIFE-STAGE TRANSITION IN CAPELIN (*MALLOTUS VILLOSUS*). *Can. J. Fish. Aquatic Sci.* 40(9):1442-1448. Sept. 1983. In English with French summ. SFA 28(4)
[Bedford Inst. Oceanogr., P.O. Box 1006, Dartmouth, NS B2Y 4A2, Canada]

83-002374 Greenfield, D. W.; T. A. Greenfield and S. L. Brinton. SPATIAL AND TROPHIC INTERACTIONS BETWEEN *GAMBUSIA SEXRADIATA* AND *GAMBUSIA PUNCTICULATA YUCATANA* (PISCES: POECILIIDAE) IN BELIZE, CENTRAL AMERICA. *Copeia* 1983(3):598-607. 1983. SFA 28(4)
[Dep. Biol. Sci., North. Ill. Univ., DeKalb 60115] The spatial and trophic interactions between two morphologically similar species of mosquitofishes

LIFE HISTORY-GENERAL WORKS (CONTINUED)

83-002374 CONTINUED (*Gambusia sexradiata* and *Gambusia puncticulata yucatana*) in the savannah ponds of Belize, Central America are examined. *G. sexradiata* is most commonly found in rivers of northern Belize but moves out over the flooded savannah areas in the rainy season and can be found in ponds, particularly those with a heavy cover of sedges and rushes, for part or all of the year. *G. p. yucatana* is seldom found in rivers; it is normally associated with savannah ponds in northern Belize and is most abundant where there is little or no vegetation. In savannah ponds with mixed habitats the two species may cooccur, and although *G. sexradiata* is more abundant in vegetated areas there is considerable spatial overlap as both species are predominantly found within two meters of the shoreline. In these circumstances, subtle microhabitat and feeding-behavior differences may allow coexistence. *G. sexradiata* feeds closer to shore on benthic, vegetation-associated items and on terrestrial shoreline organisms; *G. p. yucatana*, although overlapping to some degree in diet, tends to take greater proportions of organisms associated with the water column surface farther from shore. A comparison of this situation with that of two morphologically dissimilar species of *Gambusia* suggests when conspicuous morphological differences exist, major habitat differences can separate coexisting species, whereas when species are morphologically very similar, separation by habitat is less but is still sufficient to allow behavioral separation along a food axis.

83-002375 Kaeding, L. R. and M. A. Zimmerman. LIFE HISTORY AND ECOLOGY OF THE HUMPBACK CHUB IN THE LITTLE COLORADO AND COLORADO RIVERS OF THE GRAND CANYON. *Trans. Am. Fish. Soc.* 112(5):577-594. Sept. 1983. SFA 28(4)
[U.S. FWS, 551 25½ Rd., Grand Junction, CO 81505]

83-002376 Kupchinskaya, Y. S.; B. S. Kupchinskiy; L. N. Ryzhova; P. Y. Tugarina and L. I. Tyutrina. BIOLOGY OF THE ARCTIC GRAYLING, *THYMALLUS ARCTICUS* (THYMALLIDAE), IN UST'-ILIM RESERVOIR. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(1):47-56. 1983. SFA 28(4)
[Irkutsk Univ., USSR]

83-002377 Lassuy, D. R. SPECIES PROFILES: LIFE HISTORIES AND ENVIRONMENTAL REQUIREMENTS (GULF OF MEXICO). GULF MENHADEN. *U.S. Fish Wildl Serv.* FWS/OBS-82/11.2. 13p. Feb. 1983. SFA 28(4)
[U.S. FWS, Natl. Coastal Ecosyst. Team, 1010 Gause Blvd., Slidell, LA 70458]

83-002378 Lassuy, D. R. SPECIES PROFILES: LIFE HISTORIES AND ENVIRONMENTAL REQUIREMENTS (GULF OF MEXICO). ATLANTIC CROAKER. *U.S. Fish Wildl. Serv.* FWS/OBS-82/11.3. 12p. Feb. 1983. SFA 28(4)
[U.S. FWS, Natl. Coastal Ecosyst. Team, 1010 Gause Blvd., Slidell, LA 70458]

83-002379 Lassuy, D. R. SPECIES PROFILES: LIFE HISTORIES AND ENVIRONMENTAL REQUIREMENTS (GULF OF MEXICO). SPOTTED SEATROUT. *U.S. Fish Wildl. Serv.* FWS/OBS-82/11.4. 14p. Feb. 1983. SFA 28(4)
[U.S. FWS, Natl. Coastal Ecosyst. Team, 1010 Gause Blvd., Slidell, LA 70458]

LIFE HISTORY-GENERAL WORKS (CONTINUED)

83-002380 Minami, T. [THE EARLY LIFE HISTORY OF A TONGUE FISH *CYNOGLOSSUS JOYNERI*.] *Bull. Jpn. Soc. Sci. Fish.* 49(5):719-724. May 1983. In Japanese with English summ. SFA 28(4)

[Dep. Fish., Fac. Agric., Kyoto Univ., Kyoto 606, Japan] The early life history of a tongue fish *Cynoglossus joyneri* Günther was studied in the western Wakasa Bay, the Japan Sea. General morphology of the larvae and juveniles ranging from 5.75 mm to 16.25 mm BL, was described. The characteristic features of this fish in early larval stages were elongations of the first 2 dorsal fin rays and distributional patterns of melanophores on the body surface. Judging from gonad index and occurrence of larvae, actual spawning may occur during relatively long period from July to September in the western Wakasa Bay. Early postlarvae were caught mainly off Wakasa Bay, and late postlarvae were caught in the inner part of the Bay. Early juveniles were captured in the shallow water of the Bay, and this area may be their nursery ground. Food items in the gut contents were as follows: small copepods *Microsetella norvegica* and copepod nauplii in early larvae, copepods *Paracalanus* sp. and *M. norvegica* in metamorphosis, and copepods *Paracalanus* sp. in early juveniles.

83-002381 Minami, T. [THE EARLY LIFE HISTORY OF A FLOUNDER *TANAKIUS KITAHARAI*.] *Bull. Jpn. Soc. Sci. Fish.* 49(4):527-532. Apr. 1983. In Japanese with English summ. SFA 28(4)

[Dep. Fish., Fac. Agric., Kyoto Univ., Kyoto 606, Japan] The early life history of a flounder *Tanakius kitaharai* was studied in the western Wakasa Bay, the Japan Sea. General morphology and characteristics of the eggs, larvae and juveniles was described. The distinct feature of this fish in early larval stages was distributional patterns of melanophores on the body surface, forming three transverse bands. Judging from the occurrence of eggs, spawning may occur during the relatively short period in February in the western Wakasa Bay. Eggs and pelagic larvae were caught mainly around the mouth of Wakasa Bay and offshore region, early juveniles were caught mainly in the bottom between 110 and 130 m in depth, and these areas may be their nursery ground. Analyses of the gut contents showed that the food items are copepod nauplii, diatoms, invertebrate eggs, copepods in pelagic larvae, copepods in early juveniles, and polychaetes in late juveniles.

83-002382 Minami, T. [THE EARLY LIFE HISTORY OF A FLOUNDER *TARPHOPS OLIGOLEPIS*.] *Bull. Jpn. Soc. Sci. Fish.* 49(4):533-539. Apr. 1983. In Japanese with English summ. SFA 28(4)

[Dep. Fish., Fac. Agric., Kyoto Univ., Kyoto 606, Japan] The early life history of a flounder *Tarphops oligolepis* (Bleeker) in the western Wakasa Bay and adjacent waters, the Japan Sea was studied. General morphology of the postlarvae and juveniles ranging from 2.69 mm to 10.90 mm BL, was described. The characteristic features of this fish in early larval stages were elongations of the dorsal fin rays and distributional patterns of melanophores on the body surface, forming faint transverse bands. Judging from gonad index and occurrence of larve, actual spawning may occur during the period from May to July in the western Wakasa Bay. Postlarvae and juveniles were caught mainly in nearshore region, and this area may be their spawning and nursery ground. Analyses of the gut contents showed that the food organisms are copepod nauplii in early postlarvae, copepods in late postlarvae and mysids in juveniles, respectively. The early life histories of the three bothid flatfishes, *Paralichthys olivaceus*, *Pseudorhombus pentophthalmus* and *Tarphops oligolepis*, in the western Wakasa Bay were compared, and relation between morphological differences and ontogenetic migration in pelagic phase was discussed.

LIFE HISTORY-GENERAL WORKS (CONTINUED)

83-002383 Nordeng, H. SOLUTION TO THE "CHAR PROBLEM" BASED ON ARCTIC CHAR (*SALVELINUS ALPINUS*) IN NORWAY. *Can. J. Fish. Aquatic Sci.* 40(9):1372-1387. Sept. 1983. In English with French summ. SFA 28(4)
[Zool. Inst., Univ. Oslo, P.O. Box 1050, Blindern, Oslo 3, Norway]

83-002384 Perrotta, R. G. DISTRIBUCIÓN Y ESTRUCTURA POBLACIONAL DE LA POLACA (*MICROMESISTIUS AUSTRALIS*). [DISTRIBUTION AND POPULATION STRUCTURE OF THE POLLACK (*MICROMESISTIUS AUSTRALIS*).] *Rev. Invest. Desarr. Pesq.* No. 3. p.35-50. 1982. In Spanish with English summ. SFA 28(4)
[INIDEP, Mar del Plata, Argentina]

83-002385 Ross, S. T. SEAROBINS (PISCES: TRIGLIDAE). *Mem. Hourglass Cruises* 6(4):1-76. May 1983. SFA 28(4)
[Dep. Biol., S.S. Box 5018, Univ. South. Miss., Hattiesburg 39401]

83-002386 Shenker, J. M. DISTRIBUTION, SIZE RELATIONSHIPS, AND FOOD HABITS OF JUVENILE KING-OF-THE-SALMON, *TRACHIPTERUS ALTIVELIS*, CAUGHT OFF THE OREGON COAST. *NOAA Fish. Bull.* 81(1):161-164. Jan. 1983. SFA 28(4)
[Sch. Oceanogr., Oreg. State Univ., Corvallis 97331]

83-002387 Shiobara, Y. and K. Suzuki. [LIFE HISTORY OF TWO GOBIOIDS, *ISTIGOBIUS HOSHINONIS* (TANAKA) AND *I. CAMPBELLI* (JORDAN ET SNYDER), UNDER NATURAL AND REARING CONDITIONS.] *J. Fac. Mar. Sci. Technol. Tokai Univ.* No. 16. p.193-205. 1983. In Japanese with English summ. SFA 28(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan 424]

83-002388 Takahashi, T.; S. Saito; T. Maeda and H. Kimura. [ANNUAL LIFE PERIOD OF ADULT RIGHTEYE FLOUNDERS *LIMANDA HERZENSTEINI* AND *L. YOKOHAMAE* IN MUTSU BAY.] *Bull. Jpn. Soc. Sci. Fish.* 49(5):663-670. May 1983. In Japanese with English summ. SFA 28(4)
[Fac. Fish., Hokkaido Univ., Minato-3, Hakodate 041, Japan]

83-002389 Waltz, C. W.; W. A. Roumillat and C. A. Wenner. BIOLOGY OF THE WHITEBONE PORGY, *CALAMUS LEUCOSTEUS*, IN THE SOUTH ATLANTIC BIGHT. *NOAA Fish. Bull.* 80(4):863-874. Oct. 1982. SFA 28(4)
[S.C. Wildl. Mar. Resour. Dep., P.O. Box 12559, Charleston 29412]
Whitebone porgy, *Calamus leucosteus*, were taken in trawl surveys over reef and nonreef habitats in the South Atlantic Bight in depths of 11 to 88 m. Larger individuals were taken in greater depths. Twelve age groups can be identified with sectioned otoliths and nine using scales. Annulus formation for otoliths and scales occurs between June and July. Von Bertalanffy growth equations of $L_t=331[1-e^{-0.1731(t+2.6390)}]$ from otoliths and $L_t=362[1-e^{-0.2611(t+0.3973)}]$ from scales suggest that attainment of maximum size for this species is similar to reports for other reef species. The fork length-weight relationships for *C. leucosteus* can be described by $W=0.00004FL^{2.907}$. The whitebone porgy is a protogynous hermaphrodite; younger, smaller fish are predominately females, and older, large fish are mostly males. Sexual transition most commonly occurs between ages II-IV and fork lengths 18-25 cm Peak spawning occurs in May with total fecundity ranging from 30,400 to 1,587,400 eggs. The fecundity-weight relationship can be described by $F=10.29438\ W^{1.6562}$. Regional landings data are not

LIFE HISTORY-GENERAL WORKS (CONTINUED)

83-002389 CONTINUED available for *C. leucosteus*; however, it was the third and fourth most abundant species by weight from trawler landings in South Carolina during 1979 and 1980.

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC.

83-002390 Fréchet, A.; J. J. Dodson and H. Powles. USE OF VARIATION IN BIOLOGICAL CHARACTERS FOR THE CLASSIFICATION OF ANADROMOUS RAINBOW SMELT (*OSMERUS MORDAX*) GROUPS. *Can. J. Fish. Aquatic Sci.* 40(6):718-727. June 1983. In English with French summ. SFA 28(4)
[Dep. Fish Oceans, C.P. 15 500, Quebec, PQ G1K 7Y7, Canada]

83-002391 Beacham, T. D. and P. Starr. POPULATION BIOLOGY OF CHUM SALMON, *ONCORHYNCHUS KETA*, FROM THE FRASER RIVER, BRITISH COLUMBIA. *NOAA Fish. Bull.* 80(4):813-825. Oct. 1982. SFA 28(4)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Population biology of Fraser River chum salmon, *Oncorhynchus keta*, was investigated. Mean age of chum salmon during the run declined from 3.98 years in October to 3.78 years in December in the 1970s. Females were more abundant than males in 4-year-old chum salmon, but males were more abundant than females in 3- and 5-year-old chum salmon. Fecundity of females was 3,250 eggs/female at a standard length of 58.0 cm and did not vary among years sampled. Fry tended to migrate downstream earlier when the previous winter had been warm than when it was cold. Egg-to-fry survival was correlated with rainfall, air temperature, and number of eggs deposited. Mean age of return of a brood year was positively correlated with its abundance. The return to escapement ratio for even-numbered brood years was inversely correlated with the abundance (catch plus escapement) of the previous brood year, which suggests that marine survival of chum salmon may be density-dependent. The return to escapement ratio for odd-numbered brood years was positively correlated with early downstream migration of chum salmon fry relative to pink salmon, *O. gorbuscha*, fry and with increased chum salmon spawning escapements relative to those of pink salmon.

83-002392 Bin Huang and C. J. Walters. COHORT ANALYSIS AND POPULATION DYNAMICS OF LARGE YELLOW CROAKER IN THE CHINA SEA. *N. Am. J. Fish. Manage.* 3(3):295-305. 1983. SFA 28(4)
[Chinese Acad. Sci. Res. Tech. Design Fish., Beijing, China]

83-002393 Crecco, V.; T. Savoy and L. Gunn. DAILY MORTALITY RATES OF LARVAL AND JUVENILE AMERICAN SHAD (*ALOSA SAPIDISSIMA*) IN THE CONNETICUT RIVER WITH CHANGES IN YEAR-CLASS STRENGTH. *Can. J. Fish. Aquatic Sci.* 40(10):1719-1728. Oct. 1983. In English with French summ. SFA 28(4)
[Mar. Fish. Off., Conn. Dep. Environ. Prot., Waterford 06385]

83-002394 Cross, B. A.; D. R. Bernard and S. L. Marshall. RETURNS-PER-SPAWNER RATIOS FOR SOCKEYE SALMON IN UPPER COOK INLET, ALASKA. *Alaska Dep. Fish Game Inf. Leafl.* No. 221. vii + 82p. July 1983. SFA 28(4)
[Alaska Dep. Fish Game, Div. Commer. Fish., Statewide Stock Separation Proj., Anchorage] Returns-per-spawner ratios for sockeye salmon

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

83-002394 CONTINUED (*Oncorhynchus nerka*) from the Susitna, Kenai, Kasilof, and Crescent Rivers were calculated with catch allocations and with escapement estimates. Fish Creek was included in the catch allocation, but returns-per-spawner ratios were not calculated for it because rehabilitation work has altered spawner-return relationships. The catch was not allocated to minor sockeye salmon systems because of insufficient data. For 1978-1981 harvests, scale pattern analysis was used to allocate catches to rivers of origin. For 1972-1977 catches, allocations were made with either estimated age compositions of catch and escapement (Method I) or with estimated average exploitation rates (Method II). Although we suspect both Methods biased the returns-per-spawner ratios, but were still used because we know of no alternative procedures for the 1972-1977 period. Average returns and returns-per-spawner ratios for 1972-1981 with Method I were 416,040 and 4.5 for the Susitna, 1,652,616 and 6.7 for the Kenai, 398,017 and 6.2 for the Kasilof, and 45,773 and 2.6 for the Crescent River. Average returns and returns-per-spawner ratios for 1972-1981 with Method II were 422,116 and 4.6 for the Susitna, 1,013,595 and 6.2 for the Kenai, 451,357 and 7.0 for the Kasilof, and 41,926 and 2.6 for the Crescent River.

83-002395 De Vries, D. A. and M. E. Chittenden, Jr. SPAWNING, AGE DETERMINATION, LONGEVITY, AND MORTALITY OF THE SILVER SEATROUT, *CYNOSCION NOTHUS*, IN THE GULF OF MEXICO. *NOAA Fish. Bull.* 80(3):487-500. July 1982. SFA 28(4)

[N.C. Div. Mar. Fish., Box 769, Morehead City 28557] *Cynoscion nothus* females from the Gulf of Mexico off Texas matured at 140-170 mm SL as they approached age I. Spawning occurred from early May through late October but primarily in two periods, May and August-September. Greatest spawning occurred in the August-September period when two distinct spawned groups (intrayear class cohorts) were produced. The multiple-spawned group structure within a year class may be important to the population dynamics and stability of *C. nothus*. This species reached 130-190 mm SL at age I. Only one year class occurred or dominated in any one month, and only two year classes were ever present at once. The largest specimen captured was 190 mm SL, and 99% were <160mm. The maximum life span (t_L) was only 1-1.5 years off Texas but might be 2 years in the northcentral gulf. The total annual mortality rate was best estimated at 99.83% and probably is no lower than 90% if the life span is as long as 2 years. Larger *C. nothus* almost disappeared during winter suggesting an offshore movement for overwintering.

83-002396 Geoghegan, P. and M. E. Chittenden, Jr. REPRODUCTION, MOVEMENTS, AND POPULATION DYNAMICS OF THE LONGSPINE PORGY, *STENOTOMUS CAPRINUS*. *NOAA Fish. Bull.* 80(3):523-540. July 1982. SFA 28(4)

[Mass. Div. Mar. Fish., Cat Cove Mar. Lab., 92 Fort Ave., Salem 01970] *Stenotomus caprinus* mature at 90-125 mm TL as they approach age I. Spawning occurs once a year in a discrete period of 50-80 days duration from January through April with peak activity in February or March. The male-female sex ratio was 1:1.21 in the spawning period. Spawning occurs in waters deeper than 27 m, and its timing coincides with the periodicity of onshore surface currents in the northern Gulf of Mexico. These currents probably transport eggs and larvae inshore to nursery areas <27 m deep where recruitment occurs. Young-of-the-year gradually disperse as they mature to waters 36-55 m deep where age I and II fish were most abundant. *Stenotomus caprinus* are most vulnerable to trawling at night. Growth in length is fastest in their first 8 months but slows greatly as they mature and divert energy towards reproduction. *Stenotomus caprinus* averaged 110-135 mm TL at age I, 130-155 mm at age II, and 160 mm at age III. Maximum size is about 200 mm TL and maximum lifespan typically is 2.5-3 years. Total annual mortality rate is 83-99%, but postspawning survival, mortality rates, and lifespan vary greatly between year classes. Total weight-total length, length-length, and girth-total length relationships are

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

83-002396 CONTINUED presented. The population dynamics of *S. caprinus* appear quite different from those of *S. chrysops*, and the genus *Stenotomus* may show zoogeographic change at Cape Hatteras, N.C.

83-002397 Harrison, E. J. and W. H. Hadley. BIOLOGY OF THE NORTHERN PIKE IN THE UPPER NIAGRA RIVER WATERSHED. *N.Y. Fish Game J.* 30(1):57-66. Jan. 1983. SFA 28(4)

[Dep. Biol., State Univ. N.Y., Buffalo 14260] Several life-history parameters of northern pike in the upper Niagra River watershed were determined and compared with similar data for other populations of the species. Length-weight characteristics of Niagra River fish were like those of other populations. Ages at sexual maturity corresponded to those for pike from equivalent latitudes. Survival was poor despite rather light exploitation. Growth was similar to that among populations from more northern latitudes.

83-002398 Heist, B. G. and W. A. Swenson. DISTRIBUTION AND ABUNDANCE OF RAINBOW SMELT IN WESTERN LAKE SUPERIOR AS DETERMINED FROM ACOUSTIC SAMPLING. *J. Great Lakes Res.* 9(3):343-353. 1983. SFA 28(4)

[Mar. Stud. Cent., Univ. Wis., Madison 53706] Distribution and abundance of rainbow smelt (*Osmerus mordax*, Mitchill) in the western arm of Lake Superior were described through an acoustic sampling program conducted from June 1978 through early June 1980. Density and abundance were highest in shallow water (bottom depth<50 m), where rainbow smelt underwent vertical movements from the bottom and concentrated in warmer (11 to 16° C) near-surface water (2- to 30-m depth) at night. Rainbow smelt densities and abundance were extremely low in the deeper waters (>50 m) along the north shore and in the open lake. Abundance of rainbow smelt in the western area of the lake was estimated to be 286 X 10^6 fish (4.35 X 10^6 kg) in 1978. Abundance declined to 164 X 10^6 fish (2.5 X 10^6 kg) in 1979. Comparison of rainbow smelt abundance estimates with commercial yields suggested that annual fishing mortality is 15 to 27%. Predation by salmonid populations is considered a potentially important factor influencing smelt abundance levels. Rainbow smelt distribution and changes in abundance described by this study indicate smelt production is not high enough to support the fisheries or predator populations previously supported by native lake herring (*Coregonus artedii*, Lesueur) stocks.

83-002399 Henderson, B. A.; J. J. Collins and J. A. Reckahn. DYNAMICS OF AN EXPLOITED POPULATION OF LAKE WHITEFISH (*COREGONUS CLUPEAFORMIS*) IN LAKE HURON. *Can. J. Fish. Aquatic Sci.* 40(10):1556-1567. Oct. 1983. In English with French summ. SFA 28(4)

[Ont. Minist. Nat. Resour., Lake Huron Fish. Res. Unit, R.R.1, Tehkummah, ON P0P 2C0, Canada]

83-002400 Künzel, T.; Ü. Löwenberg and W. Weber. DEMERSAL FISH RESOURCES OF THE MAHÉ PLATEAU/SEYCHELLES. *Arch. Fischereiwiss.* 34(1):1-22. July 1983. In English with German summ. SFA 28(4)

[Küsten - Binnenfisch. Bundesforschungsanst. Fisch., Aussenstelle Cuxhaven, West Germany] In 1981 a Joint Fisheries Research Project of the Republic of Seychelles and the Federal Republic of Germany was carried out in the area of Seychelles. Two chartered trawlers performed 108 valid hauls with a one-boat bottom trawl on the Mahé Plateau. Density, total biomass and potential yield of demersal fish was estimated.

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

83-002401 Katz, S. J.; C. B. Grimes and K. W. Able. DELINEATION OF TILEFISH, *LOPHOLATILUS CHAMAELEONTICEPS*, STOCKS ALONG THE UNITED STATES EAST COAST AND IN THE GULF OF MEXICO. *NOAA Fish. Bull.* 81(1):41-50. Jan. 1983. SFA 28(4)
[Ecol. Grad. Prog., Rutgers Univ., New Brunswick, NJ 08903]

83-002402 Kazanskij, B. N. and S. B. Podushka. [ON CONSERVATION OF THE GENETIC FUND OF THE AZOV SEA STURGEON FISHES.] *Proc. All-Union Meet. Genet. Sel. Breed. Hybridization Fish.* 2:107-112. 1983. In Russian with English summ. SFA 28(4)

83-002403 Kipling, C. CHANGES IN THE POPULATION OF PIKE (*ESOX LUCIUS*) IN WINDERMERE FROM 1944 TO 1981. *J. Anim. Ecol.* 52(3):989-999. Oct. 1983. SFA 28(4)
[Freshwater Biol. Assoc., Ambleside, Cumbria, England]

83-002404 Kulikova, N. I. and J. M. Rosenvasser. [ON THE INTRASPECIFIC CHARACTERISTICS OF THE GREY MULLET (*MUGIL CEPHALUS* L.) MIGRATING TO THE AZOV SEA.] *Physiological Basis of Reproduction of Marine and Anadromous Fish. VNIRO, Moscow, USSR.* p. 25-30. 1983. In Russian with English summ. SFA 28(4)

83-002405 Michael, J. H., Jr. CONTRIBUTION OF CUTTHROAT TROUT IN HEADWATERS STREAMS TO THE SEA-RUN POPULATION. *Calif. Fish Game* 69(2):68-76. Apr. 1983. SFA 28(4)
[Wash. Dep. Fish., Harvest Manage. Div., Room 115, Gen. Admin. Bldg., Olympia, WA 98504] This study was designed to asses the contribution of populations of cutthroat trout in headwater areas of three creeks to anadromous cutthroat populations. Cutthroat living upstream of permanent barriers to anadromous fish migration in Snow and Andrews creeks are resident fish which do not migrate to saltwater. In Salmon Creek, anadromous cutthroat penetrate farther into a watershed than either steelhead trout or coho salmon and rear sympatrically with resident cutthroat populations. Consequently, some fish present in these headwater areas will migrate to saltwater. Cutthroat present in streams with indefinite or intermittent migration barriers (e.g., Salmon Creek) may be anadromous. In this study, outmigration cutthroat marked in the Salmon Creek study area are probably the progeny of anadromus cutthroat, not migrants from a resident population. A method to identify resident and anadromous cutthroat juveniles must be developed in order to more clearly define the distribution of anadromous cutthroat trout populations.

83-002406 Mundie, J. H. and R. E. Traber. CARRYING CAPACITY OF AN ENHANCED SIDE-CHANNEL FOR REARING SALMONIDS. *Can. J. Fish. Aquatic Sci.* 40(8):1320-1322. Aug. 1983. SFA 28(4)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

83-002407 Newman, R. M. and F. B. Martin. ESTIMATION OF FISH PRODUCTION RATES AND ASSOCIATED VARIANCES. *Can. J. Fish. Aquatic Sci.* 40(10):1729-1736. Oct. 1983. In English with French summ. SFA 28(4)
[Dep. Fish. Wildl., Univ. Minn., St. Paul 55108]

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

83-002408 Quinn, T. J. II; E. A. Best; L. Bijsterveld and I. R. McGregor. SAMPLING PACIFIC HALIBUT (*HIPPOGLOSSUS STENOLEPIS*) LANDINGS FOR AGE COMPOSITION: HISTORY, EVALUATION, AND ESTIMATION. *Int. Pac. Halibut Comm. Sci. Rep.* No. 68. 56p. 1983. SFA 28(4)
[Int. Pac. Halibut Comm., P.O. Box 95009, University Station, Seattle, WA 98105]

83-002409 Schainost, S. HARVEST AND POPULATION DYNAMICS OF THE WALLEYE IN BRANCHED OAK LAKE, NEBRASKA. *Nebr. Game Parks Comm. Tech. Serv.* No. 12. 35p. 1983. Available from Nebr. Game Parks Comm., P.O. Box 20270, Lincoln 68503. SFA 28(4)

A study of the walleye population in Branched Oak Lake, Nebraska, was carried out in 1979 and 1980. A population estimate was done each year with spawning fish being marked with a numbered disc-dangler tag. Summer recaptures were used to complete a Peterson population estimate of adult walleye in the lake which was 5,779 in 1979 and 5,510 in 1980. Basic data resulting from an age and growth analysis include body-scale relationships, length-frequencies, length-weight relationships, condition factors, Walford lines, and von Bertalanffy growth equations. Age and growth analysis revealed that both sexes have had very good growth, but females had significantly faster growth at all ages, the differential reaching almost 100 mm by age 6. An access point creel census estimated the walleye harvest to be 2,282 fish in 1979 and 599 fish in 1980. The estimated numbers of anglers using the lake was 32,722 in 1979 and 40,774 in 1980. Effort expended on the lake was 198.4 hours/ha in 1979 and 244.3 hours/ha in 1980 with an average trip length of 4.4 hours. The survival rate estimated from tag returns was 0.726, the exploitation rate was 0.242 in 1979 and 0.199 in 1980, and the natural mortality rate was 0.032 in 1979 and 0.075 in 1980. Tag returns revealed that over 84% of a year's walleye harvest occurred in the March 16 to June 30 period. Nonreporting of tags by anglers was estimated to be 0.303.

83-002410 Shulman, M. J. SPECIES RICHNESS AND COMMUNITY PREDICTABILITY IN CORAL REEF FISH FAUNAS. *Ecology* 64(5):1308-1311. Oct. 1983. SFA 28(4)
[Smithsonian Trop. Res. Inst., APO Miami, FL 34002]

83-002411 Slivka, A. P.; G. F. Dovgopol and S. S. Zakharov. [THE POPULATION DYNAMICS OF THE NORTH CASPIAN SEA STELLATE STURGEON.] *Biological Productivity in the Azov and Caspian Seas. VNIRO, Moscow, USSR.* p. 64-75. 1982. In Russian with English summ. SFA 28(4)

83-002412 Weinstein, M. P. POPULATION DYNAMICS OF AN ESTUARINE-DEPENDENT FISH, THE SPOT (*LEIOSTOMUS XANTHURUS*), ALONG A TIDAL CREEK-SEAGRASS MEADOW COENOCLINE. *Can. J. Fish. Aquatic Sci.* 40(10):1633-1638. Oct. 1983. In English with French summ. SFA 28(4)
[Dep. Biol., Va. Commonwealth Univ., Richmond 23284]

83-002413 Wells, L. and S. C. Jorgenson. POPULATION BIOLOGY OF YELLOW PERCH IN SOUTHERN LAKE MICHIGAN, 1971-79. *U.S. Fish Wildl. Serv. Tech. Pap.* 109. 19p. 1983. SFA 28(4)
[U.S. FWS, Great Lakes Fish. Lab., 1451 Green Rd., Ann Arbor, MI 48105]
This study was based mainly on gill-net collections of yellow perch (*Perca flavescens*) made during July and August 1971-79, in southern Lake Michigan at Grand Haven, Saugatuck, South Haven, Benton Harbor, and New Buffalo, Michigan; Michigan City and Gary, Indiana; Waukegan, Illinois; and Milwaukee, Wisconsin. Abundance of yellow perch was above the 1971-79

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

83-002413 CONTINUED average in 1971 and 1972, below average in 1979, and about average or in doubt in the other years. Abundance during 1976-79 was greatest at Saugatuck and decreased more or less progressively from Saugatuck southward and around the southern end of the lake. The geographical differences in abundance were attributable partly to differences in fishing mortality. Average lengths of fish caught were greatest at Saugatuck, and generally greater in Michigan waters than in other areas; they were greater for females than for males. Fish sampled ranged in age from I to IX, but 88% of the males and 81% of the females were of ages II-V. Older perch were generally more common in State of Michigan waters, particularly at Saugatuck, than elsewhere. Females grew faster than males after the second year of life. Average lengths of males and females at the end of 3 years were 197 and 214 mm, respectively, in Michigan waters and 186 and 195 mm in Indiana-Illinois (few perch were caught in Wisconsin). The relation of weight (W) to length (L) for combined sexes was $W = 2.6761(10^{-6}) X L^{3.2644}$. Perch in southeastern Lake Michigan spawned mainly from late May to mid June. Virtually all males were mature in their second year, but some females not until their fourth year. Perch 174 to 355 mm long contained 9,300 to 136,000 eggs. Approximate mortalities of males and females in Michigan waters were 52% and 48%, respectively; rates were higher in Indiana-Illinois.

83-002414 Whitworth, W. E. and R. J. Strange. GROWTH AND PRODUCTION OF SYMPATRIC BROOK AND RAINBOW TROUT IN AN APPALACHIAN STREAM. *Trans. Am. Fish. Soc.* 112(4):469-475. July 1983. SFA 28(4)
[Dep. Zool., Univ. Wyo., Laramie 82071]

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

83-002415 Boehlert, G. W.; W. H. Barss and P. B. Lamberson. FECUNDITY OF THE WIDOW ROCKFISH, *SEBASTES ENTOMELAS*, OFF THE COAST OF OREGON. *NOAA Fish. Bull.* 80(4):881-884. Oct. 1982. SFA 28(4)
[Mar. Sci. Cent., Oreg. State Univ., Newport 97365]

83-002416 Clavijo, I. E. DISTRIBUTION, REPRODICTIVE BIOLOGY, AND SOCIAL STRUCTURE OF THE REDBAND PARROTFISH, *SPARISOMA AUROFRENATUM* (VALENCIENNES). *Ph.D. dissertation, Univ. Puerto Rico* 176p. 1982. From Diss. Abstr. Int. B Sci. Eng. 44(1):16. July 1983. SFA 28(4)

83-002417 Colin, P. L. SPAWNING AND LARVAL DEVELOPMENT OF THE HOGFISH, *LACHNOLAIMUS MAXIMUS* (PISCES: LABRIDAE). *NOAA Fish. Bull.* 80(4):853-862. Oct. 1982. SFA 28(4)
[Mid-Pac. Res. Lab., c/o Hawaii Inst. Mar. Biol., P.O. Box 1346, Kaneohe 96744] Spawning of the hogfish, *Lachnolaimus maximus*, along a reef-sand interface near the insular shelf edge off shouthwestern Puerto Rico was observed over a period of 20 months by scuba diving. Eggs were collected and returned to the laboratory for hatching. Male-female ratio was about 1:10. Males patrolled elongate territories, which did not change during the 20 months, during the afternoon. Males initiated spawning by a courtship display using the prolonged dorsal fin spine and other fins. If the female responded, an elaborate process, termed the spawning rush, occurred during which the gametes were released. A male spawned with one female at a time, but often spawned with several females during an afternoon. Peak spawning was from December to April. There was no evidence that spawning was influenced by

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

83-002417 CONTINUED current speed or direction or by lunar or tidal periodicity. Eggs were planktonic, about 1.2 mm in diameter, lacked visible pigment, and hatched in 23 hours at 25.5°C. They were preyed on extensively by yellowtail snappers, *Ocyurus chrysurus*. Larvae, which survived in the laboratory up to 50 days, lacked a distinct transformation to juveniles but gradually acquired pigment and juvenile form after 13 days. Free-swimming postlarvae formed mucous bubbles at night.

83-002418 Ernst, M. D. and J. Nielsen. GUDENÅSTALLINGENS (*THYMALLUS THYMALLUS* (L.)) GYDEBIOLOGI. [THE SPAWNING BIOLOGY OF THE GRAYLING (*THYMALLUS THYMALLUS* (L.)) FROM THE RIVER GUDENÅ.] *Medd. Ferskvandsfiskerilab. Dan. Fisk.-Havunders.* 83(1):1-30. 1983. In Danish with English summ. SFA 28(4)
[Dan. Fisk.-Havunders. Ferskvandsfiskerilab., Lysbrogade 52, DK-8600 Silkeborg, Denmark]

83-002419 Freeze, M. and T. Crawford. FALL SPAWNING OF SILVER CARP. *Prog. Fish-Cult.* 45(2):133. Apr. 1983. SFA 28(4)
[Ark. Game Fish Comm., No. 2 Nat. Resour. Dr., Little Rock 72205]

83-002420 Goldberg, S. R. SEASONAL SPAWNING CYCLE OF THE LONGFIN SANDDAB, *CITHARICHTHYS XANTHOSTIGMA* (BOTHIDAE). *NOAA Fish. Bull.* 80(4):906-907. Oct. 1982. SFA 28(4)
[Dep. Biol., Whittier Coll., Whittier, CA 90608]

83-002421 Greeley, M. S., Jr. and R. MacGregor III. ANNUAL AND SEMILUNAR REPRODUCTIVE CYCLES OF THE GULF KILLIFISH, *FUNDULUS GRANDIS*, ON THE ALABAMA GULF COAST. *Copeia* 1983(3):711-718. 1983. SFA 28(4)
[Dep. Biol., Univ. Ala., Birmingham 35294] The breeding season of the Gulf killifish *Fundulus grandis* begins in March and extends through Aug. on the Alabama coast of the Gulf of Mexico. Gonadal regression proceeds rapidly during Sept., followed by gradual gonadal recrudescence through the winter months. Changes in female reproductive indices and spawning activity during the breeding season were temporally correlated with the biweekly tidal cycles of spring, forming semilunar reproductive cycles similar to those of *Fundulus heteroclitus*. Female reproductive indices were greatest during the biweekly spring tides and least during neap tides. Spawning occurred primarily during the spring tides in March and April and solely during the spring tides thereafter. The factors influencing the reproductive activity of *F. grandis* appear to be unidentified environmental cues associated with the tidal cycles.

83-002422 Gregory, R. S. and G. R. Daborn. NOTES ON ADULT LUMPFISH *CYCLOPTERUS LUMPUS* L. FROM THE BAY OF FUNDY. *Proc. N. S. Inst. Sci.* 32(4):321-326. 1982. In English with French summ. SFA 28(4)
[Dep. Biol., Acadia Univ., Wolfville, NS B0P 1X0, Canada]

83-002423 Igumnova, L. V. and T. A. Detlaf. THE TIME PATTERN OF MATURATION OF THE SEVRYUGA, *ACIPENSER STELLATUS* (ACIPENSERIDAE), FROM THE VOLGA SPAWNING POPULATION. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(1):62-67. 1983. SFA 28(4)
[TsNIORKh, Volgograd, USSR]

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

83-002424 Lasiak, T. A. ASPECTS OF THE REPRODUCTIVE BIOLOGY OF THE SOUTHERN MULLET, *LIZA RICHARDSONI*, FROM ALGOA BAY, SOUTH AFRICA. *S. Afr. J. Zool.* 18(2):89-95. May 1983. In English with Afrikaans summ. SFA 28(4)
[Dep. Zool., Univ. Transkei, P.B. X5092, Umtata, Transkei] The repruductive biology of the southern mullet from Algoa Bay was studied between June 1978 and October 1980. Gonadosomatic indices and macroscopic and microscopic examinations of the gonads were used to establish the breeding cycle. The period of greatest sexual development extends from September to March and spawning occurred throughout that period. Spawning probably occurs close inshore. *Liza richardsoni* exhibited the phenomenon of group synchronism, two distinct oocyte groups being present within a pre-spawning ovary. The proportion of yolkless oocytes exceeded that of vitellogenic oocytes in ripe fish. However, it was not apparent whether all the vitellogenic oocytes would reach maturity. This highlights the need for quantitative histological studies to accompany fecundity estimates. Histological investigations were useful in the clarification of breeding cycle determinations based on gonadosomatic indices and visual macroscopic assessments.

83-002425 Limberger, D. PAIRS AND HAREMS IN A CICHLID FISH, *LAMPROLOGUS BRICHARDI*. *J. Comp. Ethol.* 62(2):115-144. June 1983. SFA 28(4)
[Max-Planck-Inst. Verhaltensphysiol., D-8131 Seewiesen, West Germany]

83-002426 Loiselle, P. V. AN EXPERIMENTAL ANALYSIS OF PUPFISH (TELEOSTEI: CYRPINODONTIDAE: *CYPRINODON*) REPRODUCTIVE BEHAVIOR. *Ph.D. dissertation, Univ. Calif. (Berkeley)* 173p. 1982. From Diss. Abstr. Int. B Sci. Eng. 44(1):76. July 1983. SFA 28(4)

83-002427 Maeda, T.; T. Takahashi and M. Ueno. [BEHAVIOUR IN EACH LIFE PERIOD OF ADULT ALASKA POLLACK IN THE ADJACENT WATERS OF FUNKA BAY, HOKKAIDO.] *Bull. Jpn. Soc. Sci. Fish.* 49(4):577-585. Apr. 1983. In Japanese with English summ. SFA 28(4)
[Fac. Fish., Hokkaido Univ., Minato-3, Hakodate 041, Japan]

83-002428 Malmqvist, B. BREEDING BEHAVIOUR OF BROOK LAMPREYS *LAMPETRA PLANERI*: EXPERIMENTS ON MATE CHOICE. *Oikos* 41(1):43-48. Aug. 1983. SFA 28(4)
[Dep. Anim. Ecol., Univ. Lund, Ecol. Bldg., S-223 62 Lund, Sweden] The behaviour of spawning brook lampreys, *Lampetra planeri* (Bloch), was studied in a stream tank. Freeze-branding enabled recognition of individuals. Aggression was observed mainly at the beginning of the experiment between nest-building males and intruding males. In spite of widespread promiscuity there was a significant positive correlation in size between the partners, indicating an assortative mating. Males competed for matings and it is suggested that the most alert males are the ones most likely to mate with the females. Frequently, additional males coiled round the same female. "Satellite" males were often seen to circle rapidly round the tails of copulating pairs, probably fertilising eggs. Males took part in the spawning on average twice as long as did females. Females often mated for several days after their last eggs were spawned. The reason for this behaviour remains obscure. In another experiment large differences in partner size reduced the fertilisation efficiency. Fertilisation was most successful when the female/male length ratio was 1.05-1.14.

83-002429 Matsuyama, M. and S. Matsuura. [CHANGE IN NUMBER AND SIZE OF EGGS DURING OVARIAN MATURATION AND OVULATION OF THE AMPHIDROMOUS TYPE AYU *PLECOGLOSSUS ALTIVELIS* IN CHIKUGO RIVER.] *Bull. Jpn. Soc. Sci. Fish.*

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83-002429 CONTINUED 49(4):561-567. Apr. 1983. In Japanese with English summ. SFA 28(4)
[Dep. Fish., Fac. Agric., Kyushu Univ. 46-04, Hakozaki, Higashi, Fukuoka 812, Japan]

83-002430 Milton, D. A. and A. H. Arthington. REPRODUCTIVE BIOLOGY OF *GAMBUSIA AFFINIS HOLBROOKI* BAIRD AND GIRARD, *XIPHOPHORUS HELLERI* (GÜNTHER) AND *X. MACULATUS* (HECKEL) (PISCES; POECILIIDAE) IN QUEENSLAND, AUSTRALIA. *J. Fish Biol.* 23(1):23-41. July 1983. SFA 28(4)
[Sch. Aust. Environ. Stud., Griffith Univ., Nathan, Australia 4111]

83-002431 Parson, G. R. THE REPRODUCTIVE BIOLOGY OF THE ATLANTIC SHARPNOSE SHARK, *RHIZOPRIONODON TERRAENOVAE* (RICHARDSON). *NOAA Fish. Bull.* 81(1):61-73. Jan. 1983. SFA 28(4)
Dep. Mar. Sci., Univ. South Fla., 140 Seventh Ave. South, St. Petersburg, FL 33701] Atlantic sharpnose sharks, *Rhizoprionodon terraenovae* (Richardson), were collected in the north central Gulf of Mexico from June 1979 to May 1980. The principal sampling devices employed were longline, trawl, and rod and reel. From a total of 215 Atlantic sharpnose sharks obtained during the study, 144 were female and 71 were male, ranging from 30 to 107 cm total lengths. The reproductive anatomy of both male and female sharpnose sharks is described. Atlantic sharpnose sharks differ from other carcharhinids in that the ovary is developed on the left side in females and overlapping siphon sacs are present in males. Clasper development suggests that males mature at about 80 cm total length, while ovarian egg diameters show that female maturation occurs at about 85 cm. Matings occur primarily between mid-May and mid-July. Embryonic growth is rapid immediately after fertilization during summer and fall but declines during winter and spring. Gestation requires 10 to 11 months and parturitions probably peak in June. Pups are released near shore at an average total length of 32 cm. Statistical analyses reveal a positive relationship between adult total length and litter size, with the largest individuals being the most fecund. An inverse relationship was observed between the numbers of embryos per uterus and embryo size. Mechanical "packing" within the uterus is proposed to explain the relationship. The seasonal distribution of sharpnose sharks was found to be determined by an inshore-offshore migration. The data indicate that during winter months in deeper offshore waters, aggregates of predominately adult female sharpnose sharks may be encountered. The sex ratio at birth was found to 1:1 but among adults collected a 1:2.8 ratio was observed.

83-002432 Pollak, E. I. and T. Thompson. MULTIPLE MATINGS AND SEXUAL DICHROMATISM IN THE DWARF GOURAMI, *COLISA LALIA*. *Anim. Behav.* 30(4):1257-1258. Nov. 1982. SFA 28(4)
[Dep. Psychol., West Chester State Coll., West Chester, PA 19380]

83-002433 Potter, I. C.; R. W. Hilliard; D. J. Bird and D. J. Macey. QUANTITATIVE DATA ON MORPHOLOGY AND ORGAN WEIGHTS DURING THE PROTRACTED SPAWNING-RUN PERIOD OF THE SOUTHERN HEMISPHERE LAMPREY *GEOTRIA AUSTRALIS*. *J. Zool. (Lond.)* 200(1):1-20. May 1983. SFA 28(4)
[Sch. Environ. Life Sci., Murdoch Univ., Murdoch, W.A. 6150, Australia]

83-002434 Rinne, J. N. and B. Wanjala. MATURITY, FECUNDITY, AND BREEDING SEASONS OF THE MAJOR CATFISHES (SUBORDER: SILUROIDEA) IN LAKE VICTORIA, EAST AFRICA. *J. Fish Biol.* 23(3):357-363. Sept. 1983. SFA 28(4)

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

83-002434 CONTINUED
[Rocky Mtn. For. Range Exp. Stn., For. Sci. Lab., Ariz. State Univ., Tempe 85287] Three of the five major species of catfishes in Lake Victoria displayed continuous, protracted (fractional) spawning activity with half or more of the population in gonadal stages IV-VI. Pulses in reproductive activity occurred in all species and were generally positioned between the established, rainy seasons for East Africa. Although highly variable, relative fecundity was positively correlated with body length and weight of fish in all species. All five species matured sexually between their first and third year of life.

83-002435 Rowland, W. J. MATE CHOICE BY MALE STICKLEBACKS, *GASTEROSTEUS ACULEATUS*. *Anim. Behav.* 30(4):1093-1098. Nov. 1982. SFA 28(4)
[Dep. Biol., Indiana Univ., Bloomington 47405]

83-002436 Sargent, R. C. TERRITORY QUALITY, MALE QUALITY, COURTSHIP INTRUSIONS, AND FEMALE NEST-CHOICE IN THE THREESPINE STICKLEBACK, *GASTEROSTEUS ACULEATUS*. *Anim. Behav.* 30(2):364-374. May 1982. SFA 28(4)
[Dep. Ecol. Evol., State Univ. N. Y., Stony Brook 11794]

83-002437 Scarnecchia, D. L. AGE AT SEXUAL MATURITY IN ICELANDIC STOCKS OF ATLANTIC SALMON *(SALMO SALAR)*. *Can. J. Fish. Aquatic Sci.* 40(9):1456-1468. Sept. 1983. In English with French summ. SFA 28(4)
[Inst. Freshwater Fish., P.O. Box 754, Reykjavík, Iceland]

83-002438 Schmale, M. C. SEXUAL SELECTION AND REPRODUCTIVE SUCCESS IN MALES OF THE BICOLOR DAMSELFISH, *EUPOMACENTRUS PARTITUS* (PISCES: POMACENTRIDAE). *Anim. Behav.* 29(4):1172-1184. Nov. 1981. SFA 28(4)
[Rosenstiel Sch. Mar. Atmos. Sci., Univ. Miami, Miami, FL 33149]

83-002439 Shimizu, A. and I. Hanyu. ENVIRONMENTAL REGULATION OF SPAWNING-PERIOD IN AN AUTUMN-SPAWNING BITTERLING *PSEUDOPERILAMPUS TYPUS*. *Bull. Jpn. Soc. Sci. Fish.* 49(6):895-900. June 1983. SFA 28(4)
[Lab. Fish. Physiol., Fac. Agric., Univ. Tokyo, Bunkyo-ku, Tokyo 113, Japan] Autumn-spawning bittering *Pseudoperilampus typus* were kept under several combinations of photoperiod and temperature regimes at different phases of their annual reproductive cycle. In early autumn, the gonads developed rapidly under short photoperiod (12L) regardless of temperature. In early winter, the gonads apparently regressed under low temperature (8~12°C)in spite of adequate photoperiod regime (10L). Females kept under favorable photoperiod and temperature regime (19°C-10L) continued ovulation cycle much longer than natural spawning period, nevertheless this cycle finally terminated. It is concluded that the spawning period of *P. typus* is initiated by the shortening daylength in autumn, and is terminated by the lowering temperature in winter. Furthermore, autonomous termination of spawning under artificial conditions can be suggested.

83-002440 Sufei, J. and L. Liya. STUDIES ON THE EGGS AND LARVAE OF *SARDINELLA AURITA* (CUV. & VAL.) IN THE FISHING GROUND OF THE SOUTHERN-FUJIAN AND TAIWAN BANK.] *Oceanol. Limnol. Sin.* 14(3):240-249. 1983. In Chinese with English summ. SFA 28(4)
[Xiamen Univ., China]

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

83-002441 Suzuki, K.; S. Hioki; Y. Tanaka and H. Kitazawa. [SPAWNING AND EARLY LIFE HISTORY OF *HAPALOGENYS MUCRONATUS* (EYDOUX ET SOULEYET) (PISCES: POMADASYIDAE) IN AN AQUARIUM.] *J. Fac. Mar. Sci. Technol. Tokai Univ.* No. 16. p.183-191. 1983. In Japanese with English summ. SFA 28(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan 424]

83-002442 Taylor, M. H. and L. DiMichele. SPAWNING SITE UTILIZATION IN A DELAWARE POPULATION OF *FUNDULUS HETEROCLITUS* (PISCES: CYPRINODONTIDAE). *Copeia* 1983(3):719-725. 1983. SFA 28(4)
[Sch. Life Health Sci., Univ. Del., Newark 19711] Populations of *Fundulus heteroclitus* in mid-Atlantic salt marshes are known to deposit eggs on the marsh surface in empty shells of the Atlantic ribbed mussel (*Geukensia demissa*). Experimental placement of eggs in this location was associated with normal development and hatching, whereas placement of eggs in tidal ditches resulted in developmental arrest or death of the eggs. Eggs placed in the ditches were subject to siltation and extended periods of immersion in water of less than 2.0 ml/L dissolved oxygen. We have quantified the distribution of both eggs and *G. demissa* shells in seven 10 m deep plots along ditches in a Delaware marsh. Empty shells were unevenly distributed but were found over the entire 10 meters at densities as great as 10 per m^2, with the greater numbers usually occurring beyond 2 m from the ditch. Shells located 1-10 m from ditches were used as spawning sites with a maximum mean of 2.7 ± 1.1 spawns/m^2 occurring in the fifth meter of a heavily used plot. Our results suggest that the distribution of spawning in shells is influenced by height of the mussel shell in relation to tidal inundation, as well as size and condition of the shell, and possibly by plant distribution.

83-002443 Unger, L. M. NEST DEFENSE BY DECEIT IN THE FATHEAD MINNOW, *PIMEPHALES PROMELAS*. *Behav. Ecol. Sociobiol.* 13(2):125-130. Aug. 1983. SFA 28(4)
[Dep. Ecol. Evol., State Univ. N.Y., Stony Brook 11794] Individual male fathead minnows spawn and guard eggs for a period of several weeks during a much longer total breeding season. Solitary males remain pale and lose both wet weight and dry weight throughout the nesting period; whereas competitive males, who defend nests adjacent to territorial rivals, turn dark and do not lose wet weight despite losing dry weight. A solitary male must contend only with territorial encroachment by females (potential mates and egg predators), but a competitive male must defend the nest against both males and females. A competitive male always attacks female intruders, whereas he initially displays to intruding males. Territorial rivals, though not egg predators, may try to usurp his nest. Successful competitive nest holders may appear more robust than their true condition and thereby prevent eviction by newly reproductive male intruders. Such newcomers preferentially attack residents in relatively poor condition and pale coloration.

83-002444 Valter, G. A. [SOME DATA ON THE FECUNDITY OF PRE-SPAWNING FEMALES OF THE LONG-FINNED MULLET (*MUGIL AURATUS* RISSO).] *Physiological Basis of Reproduction of Marine and Anadromous Fish. VNIRO, Moscow, USSR.* p. 30-35. 1983. In Russian with English summ. SFA 28(4)

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

83-002445 Bax, N. J. THE EARLY MARINE MIGRATION OF JUVENILE CHUM SALMON (*ONCORHYNCHUS KETA*) THROUGH HOOD CANAL--ITS VARIABILITY AND CONSEQUENCES. *Ph.D. dissertation, Univ. Wash.* 212p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(4):979. Oct. 1983. SFA 28(4)

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

83-002446 Caron, F. MIGRATION VERS L'ATLANTIQUE DES POST-SAUMONEAUX (*SALMO SALAR*) DU GOLFE DU SAINT-LAURENT. [MIGRATION TOWARDS THE ATLANTIC OF POST-SMOLT (*SALMO SALAR*) FROM THE GULF OF ST. LAWRENCE.] *Nat. Can. (Que.)* 110(2):223-227. 1983. In French with English summ. SFA 28(4)
[Minist. Loisir, Chasse Pêche Que., 150 Blvd. St-Cyrille est, 6^e étage, PQ G1R 4Y1, Canada] Recapture of tagged post-smolt (*Salmo salar*) from Québec rivers, provide details on the migration of this species from the Gulf of St. Lawrence to the Atlantic. Post-smolt from the same river may use different exit routes from the Gulf, either the Cabot Strait or the Strait of Belle-Isle. Results also indicate that post-smolt may use an exit route different from that used by the adults during the migration to fresh waters.

83-002447 Colton, D. E. and W. S. Alevizon. MOVEMENT PATTERNS OF BONEFISH, *ALBULA VULPES*, IN BAHAMIAN WATERS. *NOAA Fish. Bull.* 81(1):148-154. Jan. 1983. SFA 28(4)
[Dep. Biol. Sci., Fla. Inst. Technol., Melbourne 32901] Bonefish appear to remain in a specific location (e.g., creek, small bay, channel, etc.) for a period usually not exceeding several days, and then move on to other locations. While at a given location, there is a distinct pattern to daily movements in response to tidal fluctuations, but long-term movements appear to be highly variable, with no definable pattern seen. In summer, larger individuals are rarely found on the flats. Their reappearance in the fall concurs with a rapid drop in water temperature at that time of the year.

83-002448 Fortier, L. and W. C. Leggett. VERTICAL MIGRATIONS AND TRANSPORT OF LARVAL FISH IN A PARTIALLY MIXED ESTUARY. *Can. J. Fish. Aquatic Sci.* 40(10):1543-1555. Oct. 1983. In English with French summ. SFA 28(4)
[The Laboratory, Citadell Hill, Plymouth PL1 2PB, England]

83-002449 Haynch, D. A.; M. R. Ross; R. E. Magnien and A. L. Suggars. NOCTURNAL INSHORE MOVEMENT OF THE MIMIC SHINER (*NOTROPIS VOLUCELLUS*): A POSSIBLE PREDATOR AVOIDANCE BEHAVIOR. *Can. J. Fish. Aquatic Sci.* 40(7):888-894. July 1983. In English with French summ. SFA 28(4)
[Dep. Ecol. Behav. Biol., Univ. Minn., Minneapolis 55455]

83-002450 Haynes, J. M. and D. C. Nettles. FALL MOVEMENTS OF BROWN TROUT IN LAKE ONTARIO AND A TRIBUTARY. *N.Y. Fish Game J.* 30(1):39-56. Jan. 1983. SFA 28(4)
[Dep. Biol. Sci., State Univ. Coll. Brockport, Brockport, NY 14420] Movements of radio-tagged brown trout during pre-spawning, spawning and post-spawning periods were studied in Lake Ontario and Sandy Creek in Monroe County (N.Y.) from September through November in 1980. Most of the tagged trout moved eastward in the lake after leaving Sandy Creek, but most of them eventually returned westward. Several made extensive east-west movements in lake Ontario, but none ascended Sandy Creek farther than 2 kilometers. Until mid-October, most of the radio-tagged brown trout remained offshore in deep water during the day and moved inshore to shallow water at night. Water temperatures where fish with temperature-sensing transmitters were located generally corresponded to surface temperatures in shallow areas and averaged 11.5°C., well within the 10°-15°C. preference range of the species. However, as surface-water temperatures declined in late autumn, brown trout moved to deeper water where the temperature, although averaging 4°C., was warmer than that at the surface. During storms, the trout generally moved offshore to deeper waters or may have left the study area.

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

83-002451 Konobeeva, V. K. ROLE OF CURRENT ON THE DISTRIBUTION OF JUVENILE FISHES IN RESERVOIRS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(1):96-102. 1983. SFA 28(4)
[Inst. Biol. Inland Waters, Acad. Sci. USSR, Borok, Yaroslavl Dist., USSR]

83-002452 Mayama, H.; J. Seki and I. Shimizu. [STUDIES ON THE CHUM SALMON RELEASED IN THE ISHIKARI RIVER SYSTEM-II. ON THE SEAWARD MIGRATION AND INSHORE DISTRIBUTION OF LIBERATED FRY IN 1980 AND 1981.] *Sci. Rep. Hokkaido Salmon Hatchery* No. 37. p. 1-22. Mar. 1983. In Japanese with English summ. SFA 28(4)
[Hokkaido Salmon Hatchery, Nakanoshima, Toyohiaku, Sapporo, Hokkaido, Japan]

83-002453 Miller, D. R. MIGRATION OF A JUVENILE WOLF EEL, *ANARRHICHTHYS OCELLATUS*, FROM PORT HARDY, BRITISH COLUMBIA, TO WILLAPA BAY, WASHINGTON. *NOAA Fish. Bull.* 80(3):650-651. July 1982. SFA 28(4)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

83-002454 Mundie, J. H. and R. E. Traber. MOVEMENTS OF COHO SALMON (*ONCORHYNCHUS KISUTCH*) FINGERLINGS IN A STREAM FOLLOWING MARKING WITH A VITAL STAIN. *Can. J. Fish. Aquatic Sci.* 40(8):1318-1319. Aug. 1983. In English with French summ. SFA 28(4)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

83-002455 Ottaway, E. M. and D. R. Forrest. THE INFLUENCE OF WATER VELOCITY ON THE DOWNSTREAM MOVEMENT OF ALEVINS AND FRY OF BROWN TROUT, *SALMO TRUTTA* L. *J. Fish Biol.* 23(2):221-227. Aug. 1983. SFA 28(4)
[Freshwater Biol. Assoc., The Ferry House, Ambleside, Cumbria LA22 0LP, England] Trout eggs were planted in four experimental stream channels, each channel being run at a different but constant discharge. Survival of the eggs to hatching was low and apparently unrelated to surface water velocity. However, movement of young trout out of channels was affected by water velocity, the higher the velocity the greater the proportion of trout that was lost. Virtually all fry moved out of a channel with a mean surface water velocity of 0.73 m s^{-1}. The rate of loss was not constant over the experiment but increased as the young trout entered the free-feeding stage. At the end of the experiment loss of fry, after abrupt increases in discharge, was demonstrated in the lower velocity channels.

83-002456 Schlotterbeck, R. E. and D. W. Connally. VERTICAL STRATIFICATION OF THREE NEARSHORE SOUTHERN CALIFORNIA LARVAL FISHES (*ENGRAULIS MORDAX, GENYONEMUS LINEATUS*, AND *SERIPHUS POLITUS*). *NOAA Fish. Bull.* 80(4):895-902. Oct. 1982. SFA 28(4)
[MBC Applied Environmental Sciences, 947 Newhall St., Costa Mesa, CA 92627]

83-002457 Storr, J. F.; P. J. Hadden-Carter; J. M. Myers and A. G. Smythe. DISPERSION OF ROCK BASS ALONG THE SOUTH SHORE OF LAKE ONTARIO. *Trans. Am. Fish. Soc.* 112(5):618-628. Sept. 1983. SFA 28(4)
[Dep. Biol. Sci., State Univ. N. Y., Buffalo 14260]

FOODS/FEEDING

83-002458 Angelescu, V. ECOLOGIA TROFICA DE LA ANCHOITA DEL MAR ARGENTINO (ENGRAULIDAE, *ENGRAULIS ANCHOITA*). PARTE II. ALIMENTACION, COMPORTAMIENTO Y RELACIONES TROFICAS EN EL ECOSISTEMA. [TROPHIC ECOLOGY OF THE ANCHOVY OF THE ARGENTINE CONTINENTAL SHELF (ENGRAULIDAE, *ENGRAULIS ANCHOITA*). PART II. FEEDING, BEHAVIOUR AND TROPHIC RELATIONSHIPS IN THE ECOSYSTEM.] *Inst. Nac. Invest. Desarr. Pesq. Ser. Contrib.* No. 409. 83p. Nov. 1982. In Spanish with English summ. SFA 28(4)
[Nac. Invest. Desarr. Pesq., Buenos Aires, Argentina]

83-002459 Angermeier, P. L. and J. R. Karr. FISH COMMUNITIES ALONG ENVIRONMENTAL GRADIENTS IN A SYSTEM OF TROPICAL STREAMS. *Environ. Biol. Fishes* 9(2):117-135. 1 Sept. 1983. SFA 28(4)
[Dep. Ecol. Ethol. Evol., Univ. Ill., 606 E. Healey, Champaign 61820] Fish community structure was examined in 9 forested streams (1-6 m wide) in central Panama during dry seasons over a 3 year period. Study regions varied in annual rainfall, degree of canopy shading, and topographical relief. Benthic invertebrates were more abundant in riffles than in pools and more abundant in early (January) than late (March) dry season. In addition, benthos abundances were negatively correlated with canopy shading among study regions. Terrestrial invertebrate abundances were greater in January than March and were correlated with stream width. Fishes were assigned to 7 feeding guilds (algivores, aquatic insectivores, general insectivores, piscivores, scale-eaters, terrestrial herbivores, omnivores) on the basis of similarity of gut contents. Four species exhibited marked dietary shifts with increasing size. Distributions of feeding guilds (biomass) among habitats and streams were not generally correlated with availabilities of their major food resources. All feeding guilds except aquatic insectivores were most concentrated (biomass per area) into deep pools. Densities of algivores and terrestrial herbivores increased with stream size, but the density of aquatic insectivores declined. Species richness of feeding guilds increased with stream size and canopy openness. The proportion of fish biomass supported by algae and terrestrial plant material increased with stream size, while that supported by aquatic and terrestrial invertebrates declined. Small fishes (<40 mm TL) were most abundant in pools of small streams. Terrestrial predators appeared to be more important than food availability in determining distributions of fish among habitats. However, trophic diversity of fish communities may be related to the reliability of available food resources.

83-002460 Berra, T. M. and P. L. Cadwallader. AGE AND GROWTH OF AUSTRALIAN GRAYLING, *PROTOTROCTES MARAENA* GÜNTER (SALMONIFORMES: PROTOTROCTIDAE), IN THE TAMBO RIVER, VICTORIA. *Aust. J. Mar. Freshwater Res.* 34(3):451-460. 1983. SFA 28(4)
[Dep. Zool., Ohio State Univ., Mansfield 44906] The age and growth of Australian grayling were studied in 1203 individuals collected from the Tambo River, Victoria, between January and November 1979. Scales from 667 grayling were examined. The scale method of age determination was validated by the analysis of seasonal changes in the pattern of scale growth and by correspondence between ages inferred from length-frequency distributions and ages determined by scale readings. One annulus is formed on the scale by October. Most (88%) grayling belonged to the 1+ and 2+ age-classes; fish aged 3+ and 4+ made up 11% of the collection, and fish aged 5+ less than 1%. Size increased from January until May; growth ceased during winter and resumed in September. There was no difference in growth between the sexes. The largest grayling collected was a female of 253 mm fork length (L_f). The overall length-weight relationship was $W = 2.715 \times 10^{-6} L_f^{3.2764}$. The relationship between

FOODS/FEEDING (CONTINUED)

83-002460 CONTINUED total length (L_t) and L_f was L_t+0.0316+1.0742 L_f, and between standard length (L_s) and L_f was L_s=0.8007+0.9095 L_f. The overall ratio of males to females was 56:44.

83-002461 Black, E. A. and C. J. Low. CTENOPHORES IN SALMON DIETS. *Trans. Am. Fish. Soc.* 112(5):728. Sept. 1983. SFA 28(4)
[Mar. Resour. Br., B. C. Minist. Environ., Parliament Bldg., Victoria, BC V8V 1X4, Canada]

83-002462 Bowen, S. H. DETRITIVORY IN NEOTROPICAL FISH COMMUNITES. *Environ. Biol. Fishes* 9(2):137-144. 1 Sept. 1983. SFA 28(4)
[Dep. Biol. Sci., Mich. Technol. Univ., Houghton 49931] Fish communities of major river systems in South America contain a high proportion of detritivorous fishes in the families Prochilodontidae and Curimatidae. These families include important fish stocks that in some regions comprise over 50 percent of the community ichthyomass. As a group, detritivores have anatomical-physiological adaptations for collection and digestion of detritus, but the actual mechamisms of these presumed adaptations have to-date only been inferred. Dietary requirements have not been identified. Behavioral adaptation is implied by feeding habitat selection but its nutritional significance is unknown. Because many of these species have commercial importance, and because ongoing construction of impoundments threatens to disrupt seasonal migrations between spawning and feeding areas, an understanding of the feeding biology of detritivores is important.

83-002463 Caragitsou, E. and N. Tsimendis. SEASONAL CHANGES AND COMPARATIVE ANALYSIS OF THE FOOD OF THE RED MULLET (*MULLUS BARBATUS*) IN THE GULF OF SARONIKOS AND THERMAIKOS. *Thalassographica* 5(2):41-61. Dec. 1982. In English with Greek summ. SFA 28(4)
[Inst. Oceanogr. Fish. Res., Athens, Greece] A detailed comparative analysis of the diets of red mullet (*Mullus barbatus*) in the Gulf of Saronikos and Thermaikos was carried out on seasonal samples collected during the period of September 1975 to June 1976. The annual and seasonal composition of both diets was calculated by number, weight and frequency of occurrence. Organisms of the major taxa of *Amphipods*, *Decapods*, *Mysidacea* and *Polychaetes* were found to be the basic food components of red mullets in both areas. *Gastropods* and *Bivalvia* constituted also a considerable part of the dietary, but of much less importance.

83-002464 Caragitsou, E. and N. Tsimenidis. SEASONAL CHANGES OF FOOD SPECTRUM AND DAY-TIME RHYTHM OF FEEDING OF THE RED MULLET (*MULLUS BARBATUS*) IN THE THRACIAN SEA. *Thallassographica* 5(2):105-115. Dec. 1982. In English with Greek summ. SFA 28(4)
[Inst. Oceanogr. Fish. Res., Athens, Greece] The seasonal and day-time feeding periodicity of red mullus (*Mullus barbatus*) from the Thracian sea was investigated on samples collected during 3 cruises in October 1976, March and July 1977. Organisms in the major taxa of *Decapods*, *Polychaetes*, *Mysidacea* and *Amphipods* were found to be of most importance in the dietary, while *Cumacea*, *Copepods* and *Bivalvia* were considered as secondary food. Members of the family *Gammaridae* predominated in most of the observation times, as did *Decapods*, while *Mysidacea* and *Polychates* were among the most frequent food components during october and March. Feeding during the day-time occurs with varying intensity and as a rule decreases in the evening.

FOODS/FEEDING (CONTINUED)

83-002465 Collins, N. C.; H. H. Harvey; A. J. Tierney and D. W. Dunham. INFLUENCE OF PREDATORY FISH DENSITY ON TRAPABILITY OF CRAYFISH IN ONTARIO LAKES. *Can. J. Fish. Aquatic Sci.* 40(10):1820-1828. Oct. 1983. In English with French summ. SFA 28(4)
[Dep. Zool., Univ. Toronto, 3359 Mississauga Rd., Mississauga, ON L5L 1C6, Canada]

83-002466 Crecco, V. A. and M. M. Blake. FEEDING ECOLOGY OF COEXISTING LARVAE OF AMERICAN SHAD AND BLUEBACK HERRING IN THE CONNECTICUT RIVER. *Trans. Am. Fish. Soc.* 112(4):498-507. July 1983. SFA 28(4)
[Conn. Dep. Environ. Prot., Mar. Fish. Off., P.O. Box 248, Waterford 06385]

83-002467 Daniels, R. A. FEEDING ECOLOGY OF SOME FISHES OF THE ANTARCTIC PENINSULA. *NOAA Fish. Bull.* 80(3):575-588. July 1982. SFA 28(4)
[N.Y. State Mus., Biol. Surv., Cult. Educ. Cent., Room 3132, Albany 12230]

83-002468 Elrod, J. H. SEASONAL FOOD OF JUVENILE LAKE TROUT IN U.S. WATERS OF LAKE ONTARIO. *J. Great Lakes Res.* 9(3):396-402. 1983. SFA 28(4)
[U.S. FWS, Great Lakes Fish. Lab., Oswego Biol. Stn., Oswego, NY 13126] Stomach contents of 3,554 lake trout (*Salvelinus namaycush*), 100 to 449 mm in total length, captured with bottom trawls during April through October 1978-81 along the south shore of Lake Ontario were examined. Invertebrates appeared to be an important food of lake trout less that 200 mm long but were only occasionally eaten by larger fish. For all seasons and size groups of juvenile lake trout combined, the slimy sculpin (*Cottus cognatus*) was the principal forage fish, making up 42% (by weight) of identifiable fish remains. Young-of-the-year slimy sculpins were a major food of recently stocked yearling lake trout during July through October. Alewives (*Alosa pseudoharengus*) were the principal forage during April and May, and made up 28% (by weight) of the identifiable fish remains. They were rarely eaten during July and August, however, when lake trout remained in the hypolimnion and alewives were above it. Over 99% of the alewives eaten from April through August were yearlings and over 99% eaten during October were young-of-the-year. Rainbow smelt (*Osmerus mordax*) were the primary forage during July and August, but contributed only a small part of the diet during other seasons; overall, they made up 25% of identifiable fish remains. Johnny darters (*Etheostoma nigrum*) made up 4% of identifiable fish remains and were most common in stomachs of small lake trout during October.

83-002469 Faragher, R. A. ROLE OF THE CRAYFISH *CHERAX DESTRUCTOR* CLARK AS FOOD FOR TROUT IN LAKE EUCUMBENE, NEW SOUTH WALES. *Aust. J. Mar. Freshwater Res.* 34(3):407-417. 1983. SFA 28(4)
[New South Wales State Fish., 211 Kent St., Sydney, N.S.W. 2000, Australia]

83-002470 Galat, D. L. and N. Vucinich. FOOD PARTITIONING BETWEEN YOUNG OF THE YEAR OF TWO SYMPATRIC TUI CHUB MORPHS. *Trans. Am. Fish. Soc.* 112(4):486-497. July 1983. SFA 28(4)
[Colo. Coop. Fish. Res. Unit, Colo. State Univ., Fort Collins 80523]

83-002471 Hamilton, J. G. and P. M. Powles. FISH PREDATION AND OTHER DISTINCTIVE FEATURES IN THE DIET OF NOGIES CREEK, ONTARIO, LARGEMOUTH BASS, *MICROPTERUS SALMOIDES*. *Can. Field-Nat.* 97(1):47-56. Jan.-Mar. 1983.

FOODS/FEEDING (CONTINUED)

83-002471 CONTINUED SFA 28(4)

[Booth Aquatic Research Group, Inc., 532 Queen St. East, Toronto, ON M5A 1V2, Canada] Fresh and back-calculated lengths and weights of fish prey pumped from 1252 largemouth bass (*Micropterus salmoides*) aged one to eight (95 to 500 mm TL) produced GM regressions of Y = .27x - 3.6 (lengths) and Y = .03x - 3.3 (weights) in the Nogies Creek sanctuary, 1977. The fish prey averaged only 3% of the predator's body weight, well below average available sizes, and below sizes reported elsewhere. Of the six main forage species, four showed a wide length range (15 to 125 mm TL) and significant positive correlation with their predator length. Contrarily, very narrow length ranges of 70 to 80 mm TL for golden shiner (*Notemigonus crysoleucas*), and 25 to 55 mm TL for basses, were consumed. Pumpkinseed (*Lepomis gibbosus*) was the most abundant prey, followed by rock bass (*Ambloplites rupestris*), perch (*Perca flavescens*), and several cyprinids. Next to the consumption of "small-packaged" fish prey, the most distinctive feature of Nogies Creek largemouth bass diet was the high predation on tadpoles. An inverse relationship was found between frog and fish diets; when frogs and tadpoles were important (up to 34% by weight, ages three to seven), fish were not. A small crayfish component (maximum 13% at age six) and very small insect component (except for age one), characterised the Nogies Creek diet in 1977. Ages one and two took Ephemeroptera, Odonata, pumpkinseed, and yellow perch, and their diet was distinct from older bass which were primarity fish/frog feeders. Bass fed from mid-April to mid-October, ceasing at 10°C water temperature.

83-002472 Hlohowsky, I. and A. M. White. FOOD RESOURCE PARTITIONING AND SELECTIVITY BY THE GREENSIDE, RAINBOW, AND FANTAIL DARTERS (PISCES: PERCIDAE). *Ohio J. Sci.* 83(4):201-208. Sept. 1983. SFA 28(4)

[Dep. Zool., Miami Univ., Oxford, OH 45056] The diets and possible competitive interactions related to food were examined for greenside (*Etheostoma blennioides*), rainbow (*E. caeruleum*), and fantail (*E. flabellare*) darters from the Chagrin and Grand Rivers of northeastern Ohio. All 3 species fed heavily upon chironomid larvae in all seasons. In the Chagrin, the chironomids consumed were primarily of the subfamily Orthocladiinae; in the Grand, the subfamily Chironominae was also important to the darters. *E. blennioides* fed most heavily upon chironomids in both streams in all seasons. *E. caeruleum* consumed fewer chironomids than did *E. blennioides* but more than *E. flabellare* (except in spring). Seasonally important prey taxa for *E. blennioides* included Simuliidae, Trichoptera, and Ephemeroptera; for *E. caeruleum*, Trichoptera and Ephemeroptera; for *E. flabellare*, Plecoptera (especially in winter), Trichoptera, and Ephemeroptera. *E. blennioides* exhibited greatest selection for *Simulium*, Orthocladiinae, and *Hydroptila*; *E. caeruleum* for *Hydroptila*, Orthocladiinae, and *Baetis*. *E. flabellare* selected for *Paracapnia*, *Baetis*, *Hydropsyche*, and *Stenonema*. Greatest seasonal dietary overlap was between *E. blennioides* and *E. caeruleum*. Lowest overlap was between *E. caeruleum* and *E. flabellare*. In both streams, overlap between *E. blennioides* and *E. caeruleum* was greatest in winter, lowest in summer. Overlap between either of these darters and *E. flabellare* was greatest in spring, lowest in winter. Heavy reliance upon the abundant chironomid larvae by the darters may aid in reducing competition and increasing foraging efficiency. Competitive interactions resulting in habitat shifts may result in reduced and different foraging areas for these fishes, which may further decrease competition between these darters.

83-002473 Hodapp, A. and D. Frey. OPTIMAL FORAGING BY FIREMOUTH CICHLIDS, *CICHLASOMA MEEKI*, IN A SOCIAL CONTEXT. *Anim. Behav.* 30(4):983-989. Nov. 1982. SFA 28(4)

FOODS/FEEDING (CONTINUED)

83-002473 CONTINUED
Colo. Mount. Coll., West Campus, 3000 County Rd. 114, Glenwood Springs 81601] Pairs of juvenile firemouth cichlids, *Cichlasoma meeki*, were allowed to feed on *Tubifex* worms for 5 min. In the experiment, the worms were distributed so as to simulate a patchy resource with two levels of average abundance. The dominant member of each cichlid pair exhibited feeding behaviour consistent with expectations from optimal foraging theory, i.e. it fed primarily in the most profitable patch initially. When food was relatively abundant, the subordinate fish fed predominantly in the second most profitable patch. In this way it minimized the costs associated with agonistic activity. This study illustrates the usefulness of a multivariate approach in the study of foraging behaviour.

83-002474 Hogue, E. W. and A. G. Carey, Jr. FEEDING ECOLOGY OF 0-AGE FLATFISHES AT A NURSERY GROUND ON THE OREGON COAST. *NOAA Fish. Bull.* 80(3):555-565. July 1982. SFA 28(4)
[Sch. Oceanogr., Oreg. State Univ., Corvallis 97331]

83-002475 Howick, G. L. and W. J. O'Brien. PISCIVOROUS FEEDING BEHAVIOR OF LARGEMOUTH BASS: AN EXPERIMENTAL ANALYSIS. *Trans. Am. Fish. Soc.* 112(4):508-516. July 1983. SFA 28(4)
[Dep. Syst. Ecol., Univ. Kans., Lawrence 66045]

83-002476 Huntingford, F. A. DO INTER- AND INTRASPECIFIC AGGRESSION VARY IN RELATION TO PREDATION PRESSURE IN STICKLEBACKS? *Anim. Behav.* 30(3):909-916. Aug. 1982. SFA 28(4)
[Dep. Zool., The University, Glasgow G12 8QQ, Scotland] The relative abundance of predatory fish at 15 sites was assessed and the reactions of sticklebacks (*Gasterosteus aculeatus*) collected from these sites to a hunting pike (*Esox lucius*) and a breeding conspecific were measured. Both the degree of boldness shown towards a pike and the level of aggression shown towards conspecifics varied significantly between sites; sticklebacks coexisting with abundant predators showed the lowest level of both these responses, but this was less clear-cut in the case of intraspecific aggression.

83-002477 Ingram, W. and C. D. Ziebell. DIET SHIFTS TO BENTHIC FEEDING BY THREADFIN SHAD. *Trans. Am. Fish. Soc.* 112(4):554-556. July 1983. SFA 28(4)
[Hunt Chemical Co., 1025 South 52nd St., Tempe, AZ 85281]

83-002478 Irvine, J. R. and T. G. Northcote. SELECTION BY YOUNG RAINBOW TROUT (*SALMO GAIRDNERI*) IN SIMULATED STREAM ENVIRONMENTS FOR LIVE AND DEAD PREY OF DIFFERENT SIZES. *Can. J. Fish. Aquatic Sci.* 40(10):1745-1749. Oct. 1983. In English with French summ. SFA 28(4)
[Dep. Zool., Univ. Otago, P.O. Box 56, Dunedin, New Zealand]

83-002479 Johnson, D. W.; D. A. Cannamela and K. W. Gasser. FOOD HABITS OF THE SHORTHEAD SCULPIN (*COTTUS CONFUSUS*) IN THE BIG LOST RIVER, IDAHO. *Northwest Sci.* 57(3):229-239. Aug. 1983. SFA 28(4)
[Hancock Biol. Stn., Murray State Univ., Murray, KY 42071] Feeding habits of the shorthead sculpin (*Cottus confusus*) were analyzed by size in both autumn and spring, and by habitat type in the spring. Indices of relative

FOODS/FEEDING (CONTINUED)

83-002479 CONTINUED importance, fullness, and benthic electivity were developed. Trichoptera, Diptera, and Ephemeroptera larvae were the most important food items with some seasonal variation. *Paragyractis* sp. larvae (Lepidoptera) was important only in the spring. Larger sculpin cannabalized both smaller fish and eggs.

83-002480 Johnson, J. H. FOOD OF RECENTLY STOCKED SUBYEARLING CHINOOK SALMON IN LAKE ONTARIO. *N.Y. Fish Game J.* 30(1):115-116. Jan. 1983. SFA 28(4)
[Nez Perce Tribe of Idaho, P.O. Box 365, Lapwai 83540]

83-002481 Johnson, J. H. SUMMER DIET OF JUVENILE FISH IN THE ST. LAWRENCE RIVER. *N.Y. Fish Game J.* 30(1):91-99. Jan. 1983. SFA 28(4)
[Nez Perce Tribe of Idaho, P.O. Box 365, Lapwai 83540] During August 1976 the stomach contents of 237 juvenile fish representing nine species from three locations along the St. Lawrence River were examined. The major food items identified in the order of percentage contribution by weight to the diet were chironomids, cladocerans, amphipods, corixids and fish. In these waters young-of-the-year largemouth bass become pisciverous by the time they are 60 millimeters long. Diet overlap was found to be significant in 11 comparisons involving eight of the nine species. The greatest overlap occurred between juvenile smallmouth bass, yellow perch and pumpkinseeds. The lowest was between largemouth bass (a piscivore) and alewife (a planktivore).

83-002482 Kentouri, M. and P. Divanach. CONTRIBUTION À LA CONNAISSANCE DU COMPORTEMENT ET DE LA BIOLOGIE DES LARVES DE MARBRÉ *LITHOGNATHUS MORMYRUS* (SPARIDES) EN ÉLEVAGE. [CONTRIBUTION TO THE KNOWLEDGE OF BEHAVIOUR AND BIOLOGY OF STRIPED SEA BREAM *LITHOGNATHUS MORMYRUS* LARVAE (SPARIDAE) IN REARING CONDITIONS.] *Ann. Zootech. (Paris)* 32(2):135-152. 1983. In French with English summ. SFA 28(4)
[Stn. Biol. Mar. Lagunaire, quai de Bose prolongé, F 34200 Sète, France] *Lithognathus mormyrus* larvae were reared from hatching to fry stage in large tanks. In polyspecific polydimensional breeding conditions including pelagic marine ciliates, the larvae grew and survived well Behavioural trends resembled those of other sparids (Kentouri & Divanach, 1982); feeding was always diversified, but mainly composed of 4 types of prey: from 2.9 to 2.5 mm, ciliates and veligers; from 4 to 7 mm, rotifers, up to 7 mm, crustacea When ciliates were not included in the ration, the early trophic phase was disturbed. Growth was low, mortality very high and survivors often entered a critical stage. After a supra normal period of prospection, activity and feeding decreased, the larvae exhibited prelarval rest postures and then died.

83-002483 Kofron, C. P. and A. A. Schreiber. THE CENTRAL MUDMINNOW (*UMBRA LIMI*) IN MISSOURI, WITH AN ANALYSIS OF SUMMER FOODS. *Southwest. Nat.* 28(3):371-372. 19 Aug. 1983. SFA 28(4)
[Dep. Zool. Physiol., La. State Univ., Baton Rouge 70803]

83-002484 Krylov, V. I. [AN ESTIMATE OF THE EFFECT OF THE CASPIAN SEAL (*PUSA CASPICA*) ON THE POPULATIONS OF FISHES.] *Zool. Zh.* 62(6):930-936. June 1983. In Russian with English summ. SFA 28(4)
[All-Union Res. Inst. Mar. Fish. Oceanogr., Moscow, USSR]

FOODS/FEEDING (CONTINUED)

83-002485 Kuwahara, A. and S. Suzuki. [VERTICAL DISTRIBUTION AND FEEDING OF TWO LARVAL FLATFISH *PSEUDORHOMBUS PENTOPHTHALMUS* AND *PLEURONICHTHYS CORNUTUS*.] *Bull. Jpn. Soc. Sci. Fish.* 49(6):875-881. June 1983. In Japanese with English summ. SFA 28(4)
[Kyoto Inst. Oceanic Fish. Sci., Miyazu, Kyoto 626, Japan]

83-002486 Kuwahara, A. and S. Suzuki. [VERTICAL DISTRIBUTION AND FEEDING OF THREE SPECIES OF ROCKFISH SCORPAENIDAE LARVAE.] *Bull. Jpn. Soc. Sci. Fish.* 49(4):515-520. Apr. 1983. In Japanese with English summ. SFA 28(4)
[Kyoto Inst. Oceanic Fish. Sci., Miyazu, Kyoto 626, Japan] Fish larvae samplings were made in the western Wakasa Bay, the Japan Sea during May and June, 1981. In view of the vertical distribution and feeding, differences among three species of Scorpaenidae larvae, *Sebasticus marmoratus* (Cuvier), *Sebastes oblongus* Günther and *Sebastes pachycephalus pachycephalus* Temminck et Schlegel are to be expected. The larvae of three species distributed abundantly in the shallow waters, especially in the water between 0 m and 25 m depths. Plankton species belonging to Crustaceae was utilized as main food for all three species, of which *S. marmoratus* and *S. pachycephalus pachycepahlus* began to feed on copepod nauplii and invertebrate eggs at yoke-sac stage. Copepod nauplii was indispensable food for three species larvae of less than 6.0 mm BL. The main food of *S. plachycephalus pachycephalus* of more than 7.0 mm BL were *Evadne nordmanni*, *Acartia clausi*, *Paracalanus parvus*, *Oithona* spp. and *Calanus helgolandicus*, and the food composition in the gut was very similar to plankton composition observed in the sea. Main food items were *P. parvus*, *E. nordmanni* and copepodites in *S. marmoratus larvae of more than 6.0 mm BL, and E. nordmanni*, copepodites and copepod nauplii in *S. oblongus* larvae of more than 6.0 mm BL. The relationships between larvae size of three species and their food size, suggests that the larvae of *S. marmoratus* and *S. pachycephalus pachycephalus* discriminate prey size as growth proceeded.

83-002487 Langton, R. W. FOOD HABITS OF YELLOWTAIL FLOUNDER, *LIMANDA FERRUGINEA* (STORER), FROM OFF THE NORTHEASTERN UNITED STATES. *NOAA Fish. Bull.* 81(1):15-22. Jan. 1983. SFA 28(4)
[Me. Dep. Mar. Resour., Mar. Res. Lab., West Boothbay Harbor 04575] Stomachs of 1,021 yellowtail flounder caught in 1973-76 contained primarily polychaetes (43%) and crustaceans (18%) as a percentage weight of total contents. The most important prey were *Spiophanes bombyx* (9.68%) and *Unicola* sp. (13.65%). Predator size had little effect on diet composition whereas geographic distribution did. *Spiophanes bombyx* was three times more important as prey on Georges Bank than in southern New England, and amphiopods were more important in southern New England than on Georges Bank. From the middle Atlantic to southern New England to Georges Bank the total weight of stomach contents increased from 0.12% to 0.14% to 0.21% of the fishes' body weight. Year-to-year differences were inconsistent; however, fish stomachs from spring cruises contained more food, 0.20%, than those from autumn cruises, 0.14% body weight. During a composite 24-hour day, peak stomach content weight occurred in the afternoon to early evening. Polychaetes accounted for less of the stomach contents at night while amphipods increased in importance during the night. Sex of the fish had no effect on diet composition although the stomachs of females were fuller than males, 0.15% vs. 0.11% body weight. Neither diet composition nor the percentage of empty stomachs were related to gonadal maturity stages, but stomachs from spawning fish contained the least amount of prey, 0.06%, while resting-stage fish contained the most, 0.24% body weight. Over a 12° C temperature range there was little change in diet composition, but between 3° and 8° C a greater percentage of stomachs contained prey and a larger quantity of prey than between 9° and 15° C. Over a 220 m depth range the

FOODS/FEEDING (CONTINUED)

83-002487 CONTINUED stomach content weight increased with depth for smaller fish (<15 cm), while the percentage of empty stomachs increased for larger fish (> 21 cm). Diet composition showed the greatest effect of depth with *S. bombyx* dominating the diet in the 74-110 m depth zone (26.6% of the stomach content weight) and *Crangon septemspinosa*, also being dominant in a single depth zone, comprising 39.6% of the diet at 147-183 m.

83-002488 Langton, R. W. DIET OVERLAP BETWEEN ATLANTIC COD, *GADUS MORHUA*, SILVER HAKE, *MERLUCCIUS BILINEARIS*, AND FIFTEEN OTHER NORTHWEST ATLANTIC FINFISH. *NOAA Fish. Bull.* 80(4):745-759. Oct. 1982. SFA 28(4)
[Dep. Mar. Resour., Mar. Resour. Lab., West Boothbay Harbor, ME 04575]

83-002489 Laroche, J. L. TROPHIC PATTERNS AMONG LARVAE OF FIVE SPECIES OF SCULPINS (FAMILY COTTIDAE) IN A MAINE ESTUARY. *NOAA Fish. Bull.* 80(4):827-840. Oct. 1982. SFA 28(4)
[Gulf Coast Res. Lab., East Beach Dr., Ocean Springs, MS 39564]

83-002490 Layzer, J. B. RESOURCE PARTITIONING AMONG YOUNG-OF-YEAR SUNFISH (*LEPOMIS* SPP.), AND PHENOTYPIC VARIATION OF BLUEGILLS (*L. MACROCHIRUS*). *Ph.D. dissertation, Okla. State Univ.* 192p. 1982. From Diss. Abstr. Int. B Sci. Eng. 44(3):692. Sept. 1983. SFA 28(4)
[Analysis of diets and use of microhabitats indicated that yoy sunfish partitioned resources. Although diets of longear sunfish (*L. megalotis*) and redear sunfish (*L. microlophus*) overlapped greatly, they used different habitats. Longears lived primarily in nonvegetated habitats while the other four species of sunfish lived mainly in dense vegetation. Warmouths (*L. gulosus*) and redear sunfish had opposite patterns of depth utilization; warmouths were more abundant in the deepest areas of the littoral zone while redears were more abundant in the shallowest areas. In 1980, bluegills and redears had moderately high overlap values for both diet and habitat; however, when diets were compared between fish collected at similar depths, overlap was reduced indicating that diets diverged more when these species occupied the same habitat. In 1981, bluegills and redears overlapped greatly in use of habitats but overlapped little in diets. Green sunfish (*L. cyanellus*) were most abundant in the shallowest vegetated areas and were segregated from other species by either microhabitat or diet. Morphometric characteristics and growth rates of bluegills indicated that specific phenotypes were associated with different habitats. Bluegills from the shallowest areas (<50cm) were more robust and grew faster in length and weight than bluegills from other depths. Bluegills collected from vegetated areas>150cm deep were more fusiform and grew faster than fish collected from intermediate depths (51-150cm).--From Abstr.

83-002491 Le Boeuf, B. J.; M. Riedman and R. S. Keyes. WHITE SHARK PREDATION ON PINNIPEDS IN CALIFORNIA COASTAL WATERS. *NOAA Fish. Bull.* 80(4):891-895. Oct. 1982. SFA 28(4)
[Cent. Coastal Mar. Stud., Univ. Calif., Santa Cruz 95064]

83-002492 Lorz, H. V.; W. G. Pearcy and M. Fraidenburg. NOTES ON THE FEEDING HABITS OF THE YELLOWTAIL ROCKFISH, *SEBASTES FLAVIDUS*, OFF WASHINGTON AND IN QUEEN CHARLOTTE SOUND. *Calif. Fish Game* 69(1):33-38. Jan. 1983. SFA 28(4)
[Sch. Oceanogr., Oreg. State Univ., Corvallis 97331] *Sebastes flavidus* caught in bottom trawls off Washington fed almost exclusively on euphausiids.

FOODS/FEEDING (CONTINUED)

83-002492 CONTINUED Those caught in midwater trawls in Queen Charlotte Sound had eaten euphausiids as well as pelagic and benthic fishes. Our limited data suggested that feeding occurred mainly during the night or early morning hours, although some feeding probably occurred during daytime as well. Diel changes in behavior associated with feeding on vertically migrating prey may explain day-night differences in catches of some rockfishes.

83-002493 Luczkovich, J. J. and B. L. Olla. FEEDING BEHAVIOR, PREY CONSUMPTION, AND GROWTH OF JUVENILE RED HAKE. *Trans. Am. Fish. Soc.* 112(5):629-637. Sept. 1983. SFA 28(4)
[Dep. Biol. Sci., Fla. State Univ., Tallahassee 32306]

83-002494 Macdonald, J. S. FOOD RESOURCE UTILIZATION BY FIVE SPECIES OF BENTHIC FEEDING FISH IN PASSAMAQUODDY BAY, N.B. *Ph.D. dissertation, Univ. West. Ontario* 1983. From Diss. Abstr. Int. B Sci. Eng. 44(3):720. Sept. 1983. SFA 28(4)
[Feeding relationships of various fish species, and their relationship to the composition of the surrounding sediments, were observed for one year at two sites in the lower Bay of Fundy region. The fishes were the ocean pout (*Macrozoarces americanus*), winter flounder (*Pseudopleuronectes americanus*), plaice (*Hippoglossoides platessoides*), cod (*Gadus morhua*) and witch flounder (*Glyptocephalus cynoglossus*). After reducing the size of the data matrix by removing redundant variables (prey items), interspecific diet overlap and the degree to which stomach contents reflect benthic composition were assessed using discriminant functions analysis. Variables were ranked by their power to discriminate among pairwise comparisons of groups: fish species and benthic samples. Many amphipods were utilized to a greater extent than their abundances in the sediments would suggest. Many annelids were underutilized. Each fish species has developed specialized feeding behaviours, digestion techniques and morphologies to segregate food resources. All species tend to increase prey intake at those places and times when benthic abundance of prey common to their diets increases. Visual predators (flounders) show different functional responses towards increased prey abundances than non-visual predators (ocean pout). In some cases availability is determined by prey size rather than prey abundance. Only a few prey species show benthic density changes as a result of predation. Benthic populations may be held at an early successionary, highly productive stage by extreme physical conditions. Large fluctuations in temperature, salinity and current could provide a force regulating benthic species abundance that is at least as important as fish predation.

83-002495 Morrison, B. R. S. OBSERVATIONS ON THE FOOD OF JUVENILE ATLANTIC SALMON, *SALMO SALAR* L, REARED IN A SCOTTISH HILL LOCH. *J. Fish Biol.* 23(3):305-313. Sept. 1983. SFA 28(4)
[D.A.F.S. Freshwater Fish. Lab., Pitlochry, Perthshire, Scotland] An analysis of the stomach contents of 0+ and 1+ Atlantic salmon parr, *Salmo salar*, introduced into a Scottish hill loch showed that benthos, plankton, and surface organisms were all taken. Molluscs comprised a relatively small proportion of the food material, probably because they are less active than other animal groups. The most abundant plankter was *Daphnia hyalina*. *Cyclops* spp. were scarce and no *Diaptomus* spp. were present in the stomachs despite their abundance in the loch plankton. Laboratory experiments indicated that copepods were difficult to capture and that *D. hyalina* was the organism most frequently selected, even when larger individuals of this species were removed from the environment. Differences between the results from the Scottish loch and similar work in Wales, Sweden and Canada are discussed.

FOODS/FEEDING (CONTINUED)

83-002496 Persson, L. EFFECTS OF INTRA- AND INTERSPECIFIC COMPETITION ON DYNAMICS AND SIZE STRUCTURE OF A PERCH *PERCA FLUVIATILIS* AND ROACH *RUTILUS RUTILUS* POPULATION. *Oikos* 41(1):126-132. Aug. 1983. SFA 28(4)
[Inst. Limnol., Box 3060, S-220 03 Lund, Sweden] Food overlap between roach *Rutilus rutilus* and perch *Perca fluviatilis* in a shallow eutrophic lake was low. Roach consumed largely detritus and algae not utilized by perch, but the competitive effect of the roach population on the perch population was substantial since the population size of roach was ten times that of perch. Competitive interactions between the species is also supported by the fact that the roach population increased at the same time that the perch population decreased. There was a small, but significant change in the size structure of the perch population. It is argued that increased interspecific competition results in a food niche contraction due to a decrease in individual growth rate and average size of the population. The same will be true when intraspecific competition increases in lakes with low habitat heterogeneity. Roach is more abundant than perch in eutrophic lakes whereas the opposite is the case of oligotrophic lakes. This is suggested to be related to availability of detritus and algae, the size distribution of food resources and the distribution of food resources with respect to habitat.

83-002497 Persson, L. FOOD CONSUMPTION AND THE SIGNIFICANCE OF DETRITUS AND ALGAE TO INTRASPECIFIC COMPETITION IN ROACH *RUTILUS RUTILUS* IN A SHALLOW EUTROPHIC LAKE. *Oikos* 41(1):118-125. Aug. 1983. SFA 28(4)
[Inst. Limnol., Box 3060, S-220 03 Lund, Sweden] In a shallow eutrophic lake in South Sweden, 75% of the food consumed by two age classes of roach *Rutilus rutilus* consisted of detritus and algae. The extensive utilization of these food items was probably caused by a shortage of animal food - a result of intraspecific competition. Food overlap between the age classes was high, but in summer they segregated with respect to animal food resources. High blue-green algal production in eutrophic lakes increases carrying capacity for roach, in relation to species not feeding on algae and detritus. Due to the poor nutritional value of detritus/algae, individual growth rates were low. Intraspecific competition has resulted in a population with small individuals and length and age class diversity of the population is low. It is argued that high intraspecific competition in fish population reduces the variation in food resources used by the population.

83-002498 Peterson, W. T.; R. D. Brodeur and W. G. Pearcy. FOOD HABITS OF JUVENILE SALMON IN THE OREGON COASTAL ZONE, JUNE 1979. *NOAA Fish. Bull.* 80(4):841-851. Oct. 1982. SFA 28(4)
[Mar. Sci. Res. Cent., State Univ. N.Y., Stony Brook 11794]

83-002499 Popova, O. A. and L. Sierra. METHODS OF STUDYING FISH NUTRITION ON THE CUBAN SHELF. SIZE-WEIGHT RATIO OF THE MAJOR PREY SPECIES OF BLACK JACK, *CARANX RUBER* (CARANGIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(1):152-156. 1983. SFA 28(4)
[IEMEZ, Moscow, USSR]

83-002500 Power, M. E. GRAZING RESPONSES OF TROPICAL FRESHWATER FISHES TO DIFFERENT SCALES OF VARIATION IN THEIR FOOD. *Environ. Biol. Fishes* 9(2):103-115. 1 Sept. 1983. SFA 28(4)
[Div. Environ. Stud., Univ. Calif., Davis 95616]

FOODS/FEEDING (CONTINUED)

83-002501 Regan, G. T. and E. J. Barranco. A SIZE-REFUGE OF *DONAX DOROTHEAE* FROM JUVENILE POMPANO. *J. Ala. Acad. Sci.* 54(3):125. July 1983. Abstract only. SFA 28(4)
[Dep. Biol., Spring Hill Coll., Mobile, AL 36608]

83-002502 Russell, B. C. THE FOOD AND FEEDING HABITS OF ROCKY REEF FISH OF NORTH-EASTERN NEW ZEALAND. *N.Z. J. Mar. Freshwater Res.* 17(2):121-145. 1983. SFA 28(4)
[Div. Nat. Sci., North. Territory Mus., P.O. Box 4646, Darwin, N.T. 5794, Australia]

83-002503 Skoptsov, V. G. and T. V. Kruppennikova. ROLE OF PLANKTOPHAGOUS FISH IN FORMATION OF STRUCTURE OF PLANKTON COMMUNITY OF A LAKE. *Sov. J. Ecol. (Engl. Transl. Ekologiya)* 13(5):322-326. May 1983. SFA 28(4)
[East Siberian. Sci.-Res. Plan. Inst. Fish., Krasnoyarsk Div., USSR] The qualitative and quantitative development of the zooplankton in the years before and after stocking of a lake with peled is compared. Considerable changes in the species, size, and trophic structure of the plankton community are observed. It is shown that planktophagous fish have a regulatory effect.

83-002504 Swartzman, G. L. and R. T. Haar. INTERACTIONS BETWEEN FUR SEAL POPULATIONS AND FISHERIES IN THE BERING SEA. *NOAA Fish. Bull.* 81(1):121-132. Jan. 1983. SFA 28(4)
[Cent. Quantitative Sci., Univ. Wash., Seattle 98195]

83-002505 Terlecki, J. POKARM NARYBKU LINA - *TINCA TINCA* (L.) Z JEZIORA DAGI. [FOOD OF TENCH FRY - *TINCA TINCA* (L.) IN LAKE DAGI.] *Zesz. Nauk. Akad. Roln. Tech. Olsz.* 12:125-135. 1983. In Polish

83-002506 Unger, P. A. and W. M. Lewis, Jr. SELECTIVE PREDATION WITH RESPECT TO BODY SIZE IN A POPULATION OF THE FISH *XENOMELANIRIS VENEZUELAE* (ATHERINIDAE). *Ecology* 64(5):1136-1144. Oct. 1983. SFA 28(4)
[Dep. Environ. Popul. Organ. Biol., Univ. Colo., Boulder 80309] The food habits of the planktivorous fish *Xenomelaniris venezuelae* (Atherinidae) in Lake Valencia, Venezuela, were studied in relation to fish size. Mean selection for major prey types and mean breadth of diet were determined for each size class of fish. The smallest fish select the rotifer *Brachionus calyciflorus* while successively larger fish select successively larger prey. Mean length and mean dry mass of the items eaten by the fish are directly related to fish length. Diet breadth, however, is inversely related to fish length, indicating that large fish feed more selectively than small fish. Evidence is presented which suggests that the relationship between *Xenomelaniris* body size and prey selection is due to increased capture efficiency with size, and that the relationship of body size to diet breadth results from growth-related improvements in vision.

83-002507 Wanjala, B. and J. D. Tash. LARGEMOUTH BASS *MICROPTERUS SALMOIDES* CHOKING ON PREY. *Southwest. Nat.* 28(3):380. 19 Aug. 1983. SFA 28(4)
[Ariz. Coop. Fish. Res. Unit, Sch. Renewable Nat. Resour., Univ. Ariz., Tuscon 85721]

FOODS/FEEDING (CONTINUED)

83-002508 Welston, J. S.; C. A. Mills and E. L. Rendle. FOOD AND HABITAT PARTITIONING IN TWO SMALL BENTHIC FISHES, *NOEMACHEILUS BARBATULUS* (L.) AND *COTTUS GOBIO* L. *Arch. Hydrobiol.* 97(4):434-454. 1983. SFA 28(4)
[Freshwater Biol. Assoc., River Lab., East Stoke, Wareham, Dorset BH20 6BB, England] The feeding and habitat preferences of the loach *Noemacheilus barbatulus* are assessed in the field and compared with those of the bullhead *Cottus gobio*. In comparison with the invertebrate fauna of the stream bed, the loach selected small organisms as food whereas the bullhead selected for larger items. Laboratory experiments on habitat selection confirmed the results from field data and showed a diel pattern of activity of the loach.

83-002509 Wolf, E. G.; B. Morson and K. W. Fucik. PRELIMINARY STUDIES OF FOOD HABITS OF JUVENILE FISH, CHINA POOT MARSH AND POTTER MARSH, ALASKA, 1978. *Estuaries* 6(2):102-114. June 1983. SFA 28(4)
[Appl. Environ. Serv., 1436 Tipperary, Boulder, CO 80303] During the year 1978, juvenile salmonids were collected from coastal streams running through China Poot Marsh and the stomach contents analyzed. Stomach contents of threespine stickleback (*Gasterosteus aculeatus*) and staghorn sculpin (*Leptocottus armatus*) from China Poot and of threespine stickleback from Potter Marsh were also analyzed; these two species were generally caught in tidal pools on the marshes. The juvenile coho salmon (*Oncorhynchus kistuch*) had the most varied diet; 37 different prey items were identified in the stomachs. By comparison, 25, 26, and 33 prey taxa were identified in the stomach contents of Dolly Varden char (*Salvelinus malma*), threespine stickleback, and staghorn sculpin, respectively. Amphipods were the dominant prey of all fish collected from China Poot Marsh; chironomidae larvae were the most common item in the stomach contents of threespine stickleback from Potter Marsh. The diets of all species changed over the course of the study period; the change was most dramatic for juvenile salmonids and sculpins.

83-002510 Wright, D. I.; W. J. O'Brien and C. Luecke. A NEW ESTIMATE OF ZOOPLANKTON RETENTION BY GILL RAKERS AND ITS ECOLOGICAL SIGNIFICANCE. *Trans. Am. Fish. Soc.* 112(5):638-646. Sept. 1983. SFA 28(4)
[Limnol. Res. Cent., 220 Pillsbury Hall, Univ. Minn., Minneapolis 55455]

83-002511 Young, L. M.; J. P. Monaghan, Jr. and R. C. Heidinger. FOOD PREFERENCES, FOOD INTAKE, AND GROWTH OF THE F_1 HYBRID OF GRASS CARP ♀ X BIGHEAD CARP ♂. *Trans. Am. Fish. Soc.* 112(5):661-664. Sept. 1983. SFA 28(4)
[Fairview Fish Cult. Stn., P.O. Box 531, Fairview, PA 16415]

83-002512 Zhiteneva, T. S. METHODS OF ESTIMATING OLIGOCHAETA AND BOTTOM MATERIALS IN THE STOMACH CONTENTS OF THE BREAM, *ABRAMIS BRAMA ORIENTALIS* (CYPRINIDAE), FROM RYBINSK RESERVOIR. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(1):57-61. 1983. SFA 28(4)
[Inst. Biol. Inland Water, USSR Acad. Sci., Borok, Yaroslavl Province, USSR] Oligochaeta may be recorded in the food of the bream, *Abramis brama orientalis*, if their biomass in muddy bottoms exceeds 2 g/m^2; bottom materials in the intestines of the bream correspond to the type of bottom deposits in the foraging places of the fish which must evidently be taken into account when studying the transformation of organic matter in bodies of water; accuracy in the determination of the weight relation of Oligochaeta, bottom materials and slime in the contents of the intestines of the bream is greater if the volume weight of the bottom material is taken into account.

AGE AND GROWTH

83-002513 Baccante, D. and J. Sandhu. ANNULUS FORMATION AND GROWTH CHARACTERISTICS OF TAGGED WALLEYE IN A LIGHTLY EXPLOITED LAKE. *Ont. Fish. Tech. Rep. Ser.* No. 9. i + 5p. 1983. SFA 28(4)
[Ontario Minist. Nat. Resour., Fish. Res., Walleye Unit, Thunder Bay, ON P7C 5G6, Canada]

83-002514 Bartoo, N. W. and K. R. Parker. STOCHASTIC AGE-FREQUENCY ESTIMATION USING THE VON BERTALANFFY GROWTH EQUATION. *NOAA Fish. Bull.* 81(1):91-96. Jan. 1983. SFA 28(4)
[NMFS, 8604 La Jolla Shores Dr., La Jolla, CA 92038] The method of estimating age frequency from length frequency via the von Bertalanffy growth equation is deterministic and yields biased results. Most of the bias can be removed by incorporating a stochastic element in the von Bertalanffy relationship. The stochastic element is based on estimated probabilities of lengths by intervals at age, the probabilities being estimated from variances in lengths-at-age. Based on age-length samples from the Pacific bonito fishery the stochastic method gives improved age-frequency estimates over those obtained by the deterministic method. The stochastic application may be generalized to all growth models including discontinuous growth such as in crustaceans.

83-002515 Bugaev, V. F. ABSENCE OF AN ANNULUS ON THE SCALE OF SOCKEYE *SALMON, ONCORHYNCHUS NERKA* (SALMONIDAE), YEARLINGS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(1):146-148. 1983. SFA 28(4)
[KoTINRO, Petropavlovsk-Kamchatskiy, USSR]

83-002516 Dery, L. M. USE OF LAMINATED PLASTIC TO IMPRESS FISH SCALES. *Prog. Fish-Cult.* 45(2):88-89. Apr. 1983. SFA 28(4)
[Northeast Fish. Cent., Woods Hole Lab., Woods Hole, MA 02543]

83-002517 Durbin, A. G.; E. G. Durbin; T. J. Smayda and P. G. Verity. AGE, SIZE, GROWTH, AND CHEMICAL COMPOSITION OF ATLANTIC MENHADEN, *BREVOORTIA TYRANNUS*, FROM NARRAGANSETT BAY, RHODE ISLAND. *NOAA Fish. Bull.* 81(1):133-141. Jan. 1983. SFA 28(4)
[Grad. Sch. Oceanogr., Univ. R. I., South Ferry Rd., Narragansett 02882] Age and size were determined for 2,015 Atlantic menhaden caught in Narragansett Bay, R.I., during 1976. Atlantic menhaden were predominantly age 2 and age 3, and in all age groups were significantly smaller than fish caught from Long Island Sound to the Gulf of Maine during 1955-71. The chemical composition of the Atlantic menhaden, as determined from analysis of selected subsamples, was ash--10.94, carbon--56.61, and nitrogen--8.03% of dry weight; kilocalories--6.238 per gram dry weight and 7.002 per gram ash-free dry weight; and dry weight--33.4% of wet weight. Instantaneous annual growth rates during the years 1970-75 were estimated from back-calculated fork lengths and wet weights at the time successive scale annuli were formed. Instantaneous daily growth rates of Atlantic menhaden in Narragansett Bay during 1976 were estimated from the growth of the scale margin beyond the 1976 annulus, and from the increase in mean fork length and wet weight of the fish as the season progressed. Growth rates of age 2 and age 3 Atlantic menhaden in 1976 were considerably greater than the respective average growth rates estimated for previous years, suggesting significant differences in age-specific growth rates of Atlantic menhaden in different regions and different years.

AGE AND GROWTH (CONTINUED)

83-002518 Dutil, J. PERIODIC CHANGES IN THE CONDITION OF THE ARCTIC CHARR (*SALVELINUS ALPINUS*) OF THE NAUYUK LAKE SYSTEM. *Ph.D. dissertation, Univ. Manitoba* 1982. From Diss. Abstr. Int. B Sci. Eng. 44(1):74. July 1983. SFA 28(4)

Starvation experiments were conducted on 400-mm hatchery-reared immature charr at temperatures ranging from 1°C to 10°C. No mortalities were recorded in 8 months. Pattern of tissue catabolism change with temperature. Losses in mass were 7.8% (1°C) and 10.9% (4°C) for 10.4% and 16.8% decreases in total energy content, much less than the 30% loss measured in Nauyuk Lake charr (400-mm length-class). This 30% loss measured in the field is the actual cost of starvation for 400-mm immature charr in a 10-month period. Charr derived 65% of their metabolic needs from lipids and 35% from proteins. The contribution of liver and skeletal muscle to total loss is discussed. In 1977, the immature charr recovered from that loss in their 2-month summer migration to sea. In June, postspawners contained 35% to 40% less energy than immature charr though maturing charr were in better condition than immature charr 12 months earlier. The smaller the charr, the lesser the time required to fully recover. In general, the produciton of gonads generally drains so much reserved of energy as to prevent charr from maturing 2 years in succession. Medium-size postspawners have the lowest lipid and protein contents (1.4% and 17.6% in June). Medium-size immature charr have the highest contents in fall (11.2% and 22.4%). These values can be as low as 0.5% and 13.6% (700-mm postspawner) and as high as 13.8% and 25.0% (700-mm immature charr in fall). These results and conclusions are discussed in terms of life-history strategies.

83-002519 Freyre, L. R.; L. C. Protogino and J. M. Iwaszkiw. DEMOGRAFIA DEL PEJERREY *BASILICHTHYS BONARIENSIS BONARIENSIS* (PISCES ATHERINIDAE) EN EL EMBALSE RIO TERCERO, CORDOBA. DESCRIPCION DE LOS ARTES DE PESCA. [DEMOGRAPHY OF THE PEJERREY (*BASILICHTHYS BONARIENSIS BONARIENSIS*) (PISCES ATHERINIDAE) OF THE RIO TERCERO DAM, CORDOBA, ARGENTINA. DESCRIPTION OF FISHING TECHNICS.] *Biol. Acuat.* No. 4. 39p. July 1983. In Spanish with English summ. SFA 28(4)

[Inst. Limnol. "Dr. Raúl A. Ringuelet, Casilla de Correo 55, 1923 Berisso, Argentina]

83-002520 Fuiman, L. A. GROWTH GRADIENTS IN FISH LARVAE. *J. Fish Biol.* 23(1):117-123. July 1983. SFA 28(4)

[Sch. Nat. Resour., S. T. Dana Bldg., Univ. Mich., Ann Arbor 48109] Relative growth intensity of various longitudinally measured body segments in larvae of several species of fishes was distributed across the body in a continuous U-shaped gradient. Juveniles lacked a simple pattern of growth but appeared to grow nearly isometrically. Body depth exhibited a shallow, U-shaped gradient while body width lacked a discernible pattern. Most intense growth in three orthogonal planes, occurred posteriorly, probably promoting effective swimming early in life.

83-002521 Funk, F. and B. E. Bracken. GROWTH OF SABLEFISH IN SOUTHEASTERN ALASKA. *Alaska Dep. Fish Game Inf. Leafl.* No. 223. iv + 40p. Aug. 1983. SFA 28(4)

[Alaska Dep. Fish Game, Div. Commer. Fish., P.O. Box 3-2000, Juneau 99802]

83-002522 Goolish, E. M. and I. R. Adelman. ^{14}C-GLYCINE UPTAKE BY FISH SCALES: REFINEMENT OF A GROWTH INDEX AND EFFECTS OF A PROTEIN-SYNTHESIS INHIBITOR. *Trans. Am. Fish. Soc.* 112(5):647-652. Sept. 1983. SFA 28(4)

[Dep. Fish. Wildl., Univ. Minn., St. Paul 55108]

AGE AND GROWTH (CONTINUED)

83-002523 Gru, D. L. and M. B. Cousseau. ESTUDIO DE EDAD Y CRECIMIENTO DE LA SARDINA FUEGUINA (*SPRATTUS FUEGENSIS*) DE LAS COSTAS DE LA PROVINCIA DE SANTA CRUZ E ISLAS MALVINAS. [STUDY ON AGE AND GROWTH OF THE «SARDINA FUEGUINA» (*SPRATTUS FUEGENSIS*) FROM THE COASTS OF SANTA CRUZ PROVINCE AND MALVINAS ISLANDS.] *Rev. Invest. Desarr. Pesq.* No. 3. p.51-58. 1982. In Spanish with English summ. SFA 28(4)
[INIDEP, Mar del Plata, Argentina]

83-002524 Holt, S. A. and C. R. Arnold. GROWTH OF JUVENILE RED SNAPPER *LUTJANUS CAMPECHANUS*, IN THE NORTHWESTERN GULF OF MEXICO. *NOAA Fish. Bull.* 80(3):644-648. July 1982. SFA 28(4)
[Univ. Tex., Mar. Sci. Inst., Port Aransas Mar. Lab., Port Aransas 78373] We suggest that growth rates of juvenile red snapper during the first 2 yr are slower than previously reported. Our data indicate snapper attain a length of 110-130 mm the first year and 200-230 mm the second year. Juvenile snapper <150 mm were common in trawl samples throughout most of the year. Snapper 130-250 mm were common on the artificial reef from July through December. Tagging studies indicated the snapper remain around the artificial reef during the summer and fall but none were captured there or elsewhere after December.

83-002525 Ishida, Y. and S. Tanaka. GROWTH AND MATURATION OF THE SMALL FILEFISH *RUDARIUS ERCODES* IN ODAWA BAY. *Bull. Jpn. Soc. Sci. Fish.* 49(4):547-553. Apr. 1983. SFA 28(4)
[Far Seas Fish. Res. Lab., Orido, Shimizu 424, Japan] Juveniles less than 20 mm total length (TL) were collected by hand beam trawl from July through October. Small-sized fish 30 to 50 mm TL began to be recruited to the catch by boat seine from August through September. Although they showed annual fluctuation of pattern in the length frequency distribution, small-sized fish grew up to large-sized fish from 50 to 70 mm TL in spring through summer of the next year. A negative relationship between population density and growth in weight was observed. The spawning season is estimated to extend from May through September judging from the seasonal change of a gonadsomatic index. Some small-sized fish recruited in summer also had well developed gonads. The rate of group maturity for females at around the end of August or time of recruitment showed annual variation, and was lower in 1977 when population density was higher than in other years.

83-002526 Jobling, M. EFFECT OF FEEDING FREQUENCY ON FOOD INTAKE AND GROWTH OF ARCTIC CHARR, *SALVELINUS ALPINUS* L. *J. Fish Biol.* 23(2):177-185. Aug. 1983. SFA 28(4)
[Inst. Fiskerifag, Univ. Tromsø, 9001 Tromsø, Norway] Social interactions and dominance hierarchy effects are important factors governing rates of growth of Arctic charr, *Salvelinus alpinus* L. The effects of hierarchy were increased as access to food became more restricted, i.e. feeding frequency was reduced, but these effects could not be attributed to direct competition for food since fish were fed to satiation at each feeding period. The results suggest that, whilst some fish on the restricted feeding regime were able to maintain good rates of growth, feeding by the majority of the fish was inhibited by the presence of larger individuals. Due to the importance of these hierarchy effects if was not possible to demonstrate physiological adaptations in fish allowed infrequent access to food.

83-002527 Johnson, A. G.; W. A. Fable, Jr.; M. L. Williams and L. E. Barger. AGE, GROWTH, AND MORTALITY OF KING MACKEREL, *SCOMBEROMORUS CAVALLA*, FROM THE SOUTHEASTERN UNITED STATES. *NOAA Fish. Bull.*

AGE AND GROWTH (CONTINUED)

83-002527 CONTINUED 81(1):97-106. Jan. 1983. SFA 28(4)
[NMFS, 3500 Delwood Beach Rd., Panama City, FL 32407-7499]

83-002528 Kirkwood, G. P. ESTIMATION OF VON BERTALANFFY GROWTH CURVE PARAMETERS USING BOTH LENGTH INCREMENT AND AGE-LENGTH DATA. *Can. J. Fish. Aquatic Sci.* 40(9):1405-1411. Sept. 1983. In English with French summ. SFA 28(4)
[Div. Fish. Res., CSIRO Mar. Lab., P.O. Box 21, Cronulla, NSW 2230, Australia]

83-002529 Libby, D. A. DECREASE IN LENGTH AT PREDOMINANT AGES DURING A SPAWNING MIGRATION OF THE ALEWIFE, *ALOSA PSEUDOHARENGUS*. *NOAA Fish. Bull.* 80(4):902-905. Oct. 1982. SFA 28(4)
[Dep. Mar. Resour., Mar. Resour. Lab., West Boothbay Harbor, ME 04575]

83-002530 Magnan, P. and G. J. Fitzgerald. ÂGE SCALAIRE ET OTOLITHIQUE DE L'OMBLE DE FONTAINE (*SALVELINUS FONTINALIS*): COMPARAISON ET INTERPRÉTATION DES FAUX ANNULI. [SCALE AND OTOLITH AGE OF BROOK CHARRS (*SALVELINUS FONTINALIS*): COMPARISON AND INTERPRETATION OF FALSE ANNULI.] *Nat. Can. (Que.)* 110(2):149-154. 1983. In French with English summ. SFA 28(4)
[Dep. Biol., Univ. Laval, PQ G1K 7P4, Canada] We compared scale and otolith age of 143 brook charrs (*Salvelinus fontinalis*) from an exploited population which has a rapid growth rate. Age as determined by the two methods was in agreement in 92% of the cases. When these two methods gave different results, the scale age was generally lower than the otolith age. Our results confirm that the otolith method is applicable to exploited populations, with rapid growth rate. The false annuli regularly found on otoliths do not present a major obstacle to accurate age determination as they are readily identifiable. Two hypotheses are presented to explain the presence of false annuli.

83-002531 Moriarty, C. AGE DETERMINATION AND GROWTH RATE OF EELS, *ANGUILLA ANGUILLA* (L). *J. Fish Biol.* 23(3):257-264. Sept. 1983. SFA 28(4)
[Fish. Res. Cent., Abbotstown, Castleknock, Co. Dublin, Ireland]

83-002532 Nottage, A. S. and E. J. Perkins. GROWTH AND MATURATION OF ROKER *RAJA CLAVATA* L. IN THE SOLWAY FIRTH. *J. Fish Biol.* 23(1):43-48. July 1983. SFA 28(4)
[Mar. Lab., Univ. Strothclyde, Helensburgh, Dunbartonshire G84 0JQ, Scotland]

83-002533 Papageorgiou, N. and C. Neophytou. AGE, GROWTH AND FECUNDITY OF THE RUDD (*SCARDINIUS ERYTHROPTHALMUS* L.) IN LAKE KASTORIA. *Thalassographica* 5(2):5-15. Dec. 1982. In English with Greek summ. SFA 28(4)
[Lab. Wildl. Freshwater Fish., Sch. Agric. For., Univ. Thessaloniki, Greece] The growth of rudd (*Scardinius erythropthalamus* L.) was most rapid during the first year of life (53 mm). Thereafter decreased and reached 21 mm at the end of the fourth year of life, after which remained constant at approximately 13 mm. The rudd's span of life was 8 and 7 years for female and

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83-002533 CONTINUED male respectively. The mean absolute fecundity was 3,712 eggs with a range from 563 to 12,284 eggs. The mean, relative fecundity was 132 eggs/g body weight and ranged from 85 to 182. Rudd became sexually mature at age 1+ for males and one year later for females. Spawning occured during the second half of April, at a mean water temperature of 10°C. The gonad weight is a constant proportion of the body weight and is independent of the age of the fish.

83-002534 Pisano, M. S.; M. J. Inansci and W. L. Minckley. AGE AND GROWTH AND LENGTH-WEIGHT RELATIONSHIP FOR FLATHEAD CATFISH, *PYLODICTIS OLIVARIS*, FROM COACHELLA CANAL, SOUTHEASTERN CALIFORNIA. *Calif. Fish Game* 69(2):124-128. Apr. 1983. SFA 28(4)
[Dep. Zool., Ariz. State Univ., Tempe 85287]

83-002535 Ru-yung, S. and Z. Yu-shu. THE INFLUENCE OF WATER TEMPERATURE ON THE GROWTH OF TILAPIANS. *Bull. Mar. Sci.* 33(3):782. July 1983. Abstract only. SFA 28(4)
[Dep. Biol., Beijing Normal Univ., Beijing, China] The growth of tilapians was studied at different temperatures (22°-36°C) in aquaria. The changes in body weights and total lengths observed in 370 individuals (20 experimental groups, 4 series) show that optimum temperature for growth of tilapians weighing 8-12 g is 28°-30°C. From 22°-28°C, growth rate increases with temperature whereas from 32°C-36°C an inverse relationship is found. From 22°-32°C, food consumption increases with temperature, while a reduction occurrs within 32°-36°C range. As is well known, the maintenance cost increases with temperature and that is why the relationship of growth to temperature takes the form of an inverse bell shape. The group with higher density has a lower growth rate than those grown at a lower density other conditions being equal. However, the total gain in weight of the higher density group may be greater as long as the total biomass in the aquarium is much less than its normal carrying capacity. It would be desireable to determine the time when the rising total production of the higher density group is surpassed by that of the lower density group.

83-002536 Sánchez, R. P. CONSIDERACIONES SOBRE EL CRECIMIENTO DE LA CABALLA (*SCOMBER JAPONICUS MARPLATENSIS*) DURANTE SU PRIMER AÑO DE VIDA. [STUDIES ON THE GROWTH OF THE MACKEREL (*SCOMBER JAPONICUS MARPLATENSIS*) DURING THE FIRST YEAR OF LIFE.] *Rev. Invest. Desarr. Pesq.* No. 3. p.15-34. 1982. In Spanish with English summ. SFA 28(4)
[INIDEP, Mar del Plata, Argentina]

83-002537 Tin, H. T. and D. J. Jude. DISTRIBUTION AND GROWTH OF LARVAL RAINBOW SMELT IN EASTERN LAKE MICHIGAN, 1978-1981. *Trans. Am. Fish. Soc.* 112(4):517-524. July 1983. SFA 28(4)
[Great Lakes Res. Div., Univ. Mich., Ann Arbor 48109]

83-002538 Wilson, J. P. F. and T. J. Pitcher. THE SEASONAL CYCLE OF CONDITION IN THE POLLAN, *COREGONUS AUTUMNALIS POLLAN* THOMPSON, OF LOUGH NEAGH, NORTHERN IRELAND. *J. Fish Biol.* 23(3):365-370. Sept. 1983. SFA 28(4)
[T.J. Pitcher: Sch. Anim. Biol., Univ. Coll. North Wales, Bangor, Gwynedd, Wales] The length-weight relationship for Lough Neagh pollan was log W=3.2 log L-2.24. Covariance analysis indicated that there were no differences between the sexes, with maturity, or between years. While a seasonal cycle in relative condition was in phase with gonad development

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83-002538 CONTINUED during late summer and autumn, changes in somatic condition presented a more complex pattern. Somatic condition increased in spring, as did the quantity and diversity of food consumed. Despite good conditions for feeding and growth, there was an autumn fall in somatic condition, caused by the diversion of energy to gonad growth.

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC.

83-002539 Bulatov, O. A. DISTRIBUTION OF EGGS AND LARVAE OF GREENLAND HALIBUT, *REINHARDTIUS HIPPOGLOSSOIDES* (PLEURONECTIDAE), IN THE EASTERN BERING SEA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(1):157-159. 1983. SFA 28(4)
[TINRO, Vladivostok, USSR]

83-002540 Cooper, J. J. DISTRIBUTIONAL ECOLOGY OF NATIVE AND INTRODUCED FISHES OF THE PIT RIVER SYSTEM, NORTHEASTERN CALIFORNIA, WITH NOTES ON THE MODOC SUCKER. *Calif. Fish Game* 69(1):39-53. Jan. 1983. SFA 28(4)
[Bioresour. Cent., Desert Res. Inst., P.O. Box 60220, Reno, NV 89506]

83-002541 Dempson, J. B.; L. J. Ledrew and G. Furey. OCCURRENCE OF AMERICAN SHAD (*ALOSA SAPIDISSIMA*) IN NORTHERN LABRADOR WATERS. *Nat. Can. (Que.)* 110(2):217-221. 1983. In English with French summ. SFA 28(4)
[Dep. Fish. Oceans, P.O. Box 5667, St. John's, NF A1C 5X1, Canada]
American shad (*Alosa sapidissima*) were captured at sea in the Nain area of northern Labrador during July and August, 1979. This extends the reported northern distribution of the species in the Northwest Atlantic by approximately five hundred kilometres.

83-002542 Dixon, D. A.; B. A. Branson and D. L. Batch. CORRELATION OF FISH DISTRIBUTION AND STREAM ORDER IN THE UPPER CUMBERLAND AND UPPER KENTUCKY RIVERS BASED UPON AN INFORMATION RETRIEVAL SYSTEM. *Trans. Ky. Acad. Sci.* 44(3-4):111-116. Sept. 1983. SFA 28(4)
[Dep. Biol. Sci., East. Ky. Univ., Richmond 40475]

83-002543 Fierstine, H. L. and B. J. Welton. A BLACK MARLIN, *MAKAIRA INDICA*, FROM THE EARLY PLEISTOCENE OF THE PHILIPPINES AND THE ZOOGEOGRAPHY OF ISTIOPHORID BILLFISHES. *Bull. Mar. Sci.* 33(3):718-728. July 1983. SFA 28(4)
[Biol. Sci. Dep., Calif. Polytech. State Univ., San Luis Obispo 93407]

83-002544 George, C. J. OCCURRENCE OF THE GIZZARD SHAD IN THE LOWER MOHAWK VALLEY. *N.Y. Fish Game J.* 30(1):113-114. Jan. 1983. SFA 29(4)
[Dep. Biol. Sci., Union Coll., Schenectady, NY 12308]

83-002545 Gilmore, R. G.; C. J. Donohoe and D. W. Cooke. OBSERVATIONS ON THE DISTRIBUTION AND BIOLOGY OF EAST-CENTRAL FLORIDA POPULATIONS OF THE COMMON SNOOK, *CENTROPOMUS UNDECIMALIS* (BLOCH). *Fla. Sci.*

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

83-002545 CONTINUED 46(3-4):313-336. 1983. SFA 28(4)
[Harbor Branch Found., Inc., R.R.1, Box 196, Fort Pierce, FL 33450]

83-002546 Golovan', G. A. and N. P. Pakhorukov. THE COMPOSITION OF THE DEMERSAL ICHTHYOFAUNA OF THE DISCOVERY TABLEMOUNT. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(1):13-19. 1983. SFA 28(4)
[SEKBP, Sevastopol, USSR]

83-002547 Grenfell, H. R. LOWER MIOCENE TELEOST OTOLITHS FROM NEW ZEALAND. *Bull. Mar. Sci.* 33(3):779. July 1983. Abstract only. SFA 28(4)
[Dep. Geol. Geophys., Sydney Univ., Sydney, N.S.W., Australia 2006]

83-002548 Hickey, C. R., Jr. and J. W. Lester. THE FISHES OF FORT POND BAY ON LONG ISLAND, NEW YORK. *N.Y. Fish Game. J.* 30(1):100-112. Jan. 1983. SFA 28(4)
[U.S. Nuclear Regul. Comm., Environ. Eng. Br., Washington, D.C. 20555]

83-002549 Jenkins, R. E. and R. C. Cashner. RECORDS AND DISTRIBUTIONAL RELATIONSHIPS OF THE ROANOKE BASS, *AMBLOPLITES CAVIFRONS*, IN THE ROANOKE RIVER DRAINAGE, VIRGINIA. *Ohio J. Sci.* 83(4):146-155. Sept. 1983. SFA 28(4)
[Dep. Biol., Roanoke Coll., Salem, VA 24153] The roanoke bass, *Ambloplites cavifrons*, is nearly extirpated from the Ridge and Valley province section of the upper Roanoke River drainage, Virginia, where it formerly was widespread. The species declined therein during the 1950s, coinciding with establishment of the introduced rock bass, *A. rupestris*. Siltation, pollution and impoundments also adversely affect *A. cavifrons* in this and other areas. Hybrids, *A. cavifrons* X *A. rupestris*, are known from 3 Ridge and Valley streams, only one of which still supports Roanoke bass. Populations of *A. cavifrons* remain widespread in Blackwater and Pigg Rivers, in the upper Piedmont section of the upper Roanoke. Significant new records of Roanoke and rock basses are reported from other Piedmont or Coastal Plain streams of the Roanoke and Chowan drainages, Va.

83-002550 Johal, M. S. FIELD KEY TO THE FISHES OF GANGANAGAR DISTRICT (RAJASTHAN). *Res. Bull. Panjab Univ.* 33(3-4):43-49. Dec. 1982. SFA 28(4)
[P.G. Dep. Zool., S. G. N. Kahsa Coll., Sirganganagar, India]

83-002551 Karmovskaya, É. S. NEW DATA ON THE DISTRIBUTION OF *STEMONIDIUM HYPOMELAS* (SERRIVOMERIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(1):136-138. 1983. SFA 28(4)
[Inst. Oceanol., Acad. Sci. USSR, IOAN, Moscow, USSR]

83-002552 Leidy, R. A. DISTRIBUTION OF FISHES IN STREAMS OF THE WALNUT CREEK BASIN, CALIFORNIA. *Calif. Fish Game* 69(1):23-32. Jan. 1983. SFA 28(4)
[Dep. For. Resour. Manage., Univ. Calif., Berkeley 94720]

83-002553 Luchini, L. ESTUDIOS ECOLOGICOS EN LA CUENCA DEL RIO LIMAY (ARGENTINA). [ECOLOGICAL STUDIES IN THE LIMAY RIVER (ARGENTINA).] *Rev. Asoc. Cienc. Nat. Litoral*. No. 12. p. 44-58. 1981. In Spanish with English

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83-002553 CONTINUED summ. SFA 28(4)
[Inst. Nac. Invest. Desarr. Pesq., Casilla de Correo 175, 7600 Mar del Plata, Argentina]

83-002554 Mangini, M. A. FIRST RECORD OF A TEXAS POPULATION OF *TILAPIA* (PISCES: CICHLIDAE). *Southwest. Nat.* 28(3):374-375. SFA 28(4)
[Univ. South Fla., Dep. Mar. Sci., 140 Seventh Ave. South, St. Petersburg 33701]

83-002555 Marais, J. F. K. SEASONAL ABUNDANCE, DISTRIBUTION AND CATCH PER UNIT EFFORT OF FISHES IN THE KROM ESTUARY, SOUTH AFRICA. *S. Afr. J. Zool.* 18(2):96-102. May 1983. In English with Afrikaans summ. SFA 28(4)
[Dep. Zool., Univ. Port Elizabeth, South Africa]

83-002556 Martin, J. D. and M. J. Dadswell. RECORDS OF COHO SALMON, *ONCORHYNCHUS KISUTCH* (WALBAUM, 1792), IN THE BAY OF FUNDY AND ITS TRIBUTARY DRAINAGE. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1204. iii + 6p. Sept. 1983. In English with French summ. SFA 28(4)
[Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

83-002557 Miller, R. R. CHECKLIST AND KEY TO THE MOLLIES OF MEXICO (PISCES: POECILIIDAE: *POECILIA*, SUBGENUS *MOLLIENESIA*). *Copeia* 1983(3):817-822. 1983. SFA 28(4)
[Mus. Zool., Univ. Mich., Ann Arbor 48109]

83-002558 Mulligan, T. J. and F. F. Snelson, Jr. SUMMER-SEASON POPULATIONS OF EPIBENTHIC MARINE FISHES IN THE INDIAN RIVER LAGOON SYSTEM, FLORIDA. *Fla. Sci.* 46(3-4):250-276. 1983. SFA 28(4)
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83-002559 Naumov, A. G.; M. F. Svetlov; A. N. Kozlov and I. A. Pinskaya. SOME PECULIARITIES OF DISTRIBUTION AND FEEDING OF *NOTOTHENIA GUENTHERI* (NOTOTHENIIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(1):149-151. 1983. SFA 28(4)
[VNIRO, Moscow, USSR]

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[Natl. Zool. Gardens South Africa, P.O. Box 754, Pretoria 0001, South Africa]

83-002561 Phelan, J. E. FIRST CALIFORNIAN RECORD OF THE AMARILLO SNAPPER, *LUTJANUS ARGENTIVENTRIS*. *Calif. Fish Game* 69(2):121-122. Apr. 1983. SFA 28(4)

83-002562 Rice, S. P.; J. R. MacGregor and W. L. Davis. DISTRIBUTIONAL RECORDS FOR FOURTEEN FISHES IN KENTUCKY. *Trans. Ky. Acad. Sci.* 44(3-4):125-128. Sept. 1983. SFA 28(4)
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83-002564 Snelson, F. F., Jr. ICHTHYOFAUNA OF THE NORTHERN PART OF THE INDIAN RIVER LAGOON SYSTEM, FLORIDA. *Fla. Sci.* 46(3-4):187-206. 1983. SFA 28(4)
[Dep. Biol. Sci., Univ. Cent. Fla., Orlando 32816]

83-002565 Sulak, K. J. A COMPARATIVE TAXONOMIC AND ECOLOGICAL ANALYSIS OF TEMPERATE AND TROPICAL DEMERSAL DEEP-SEA FISH FAUNAS IN THE WESTERN NORTH ATLANTIC. *Ph.D. dissertation, Univ. Miami* 193p. 1982. From Diss. Abstr. Int. B Sci. Eng. 44(1):18. July 1983. SFA 28(4)

The demersal deep-sea fish fauna of the temperate eutrophic Middle Atlantic Bight (MAB) is compared with that of the tropical oligotrophic Bahamas region between depths of 900 and 5500 m. Of 136 species collected, 52 are shared. A taxonomic dichotomy between the two faunas reveals a fundamental pattern of differentiation among Atlantic deep-sea bottomfishes. Taxa of cold temperate-boreal origin with energetically expensive life histories (Moridae, Macrouridae) predominate beneath eutrophic waters. Taxa of warm temperate-tropical affinities with energetically conservative life histories (Ophidiidae, Chlorophthalmidae, Halosauridae) prevail beneath oligotrophic waters. The dichotomy appears to relate to regional differences in benthic macrofaunal prey availability. Numbers and biomass of fishes decline with depth in both regions. Population densities are higher in the MAB than in the Bahamas at slope depths, but are comparable below 3000 m. Biomass is uniformly higher in the MAB by about an order of magnitude at all depths, paralleling a comparable regional disparity in macrofaunal biomass. Mean fish weight displays a "bigger-deeper" trend only in the MAB. Both large and small species are important at all depths in the Bahamas. Species replacement takes place continuously, but at a variable rate. Bathymetric replacement gives the appearance of zonation with depth, but well-defined discontinuities are not apparent. Faunal richness is vary stable across station groups and between regions, suggesting that "diversity" does not decline with depth. Species tend to space themselves randomly in the environment; individuals and units of biomass tend to be mildy aggregated. Such patterns suggest independent foraging and selective feeding among species. On the outer rise and abyss two alternative feeding modes prevail: euryphagy by large mobile species or nektonic microphagy by small sedentary species. Competitive exclusion is suggested by bathymetric complementation both within and between regions. This conclusion is reinforced by the limitation of and stability of faunal richness over depth. The longstanding generalization of demersal deep-sea fishes as non-selective, non-competing trophic generalists is inadequate.

83-002566 Williams, R. THE INSHORE FISHES OF HEARD AND MCDONALD ISLANDS, SOUTHERN INDIAN OCEAN. *J. Fish Biol.* 23(3):283-292. Sept. 1983. SFA 28(4)
[Antarctic Div., Dep. Sci. Technol., Channel Highway, Kingston 7150, Tasmania, Australia]

83-002567 Witzel, L. D. THE OCCURRENCE AND ORIGIN OF TIGER TROUT, *SALMO TRUTTA* X *SALVELINUS FONTINALIS*, IN ONTARIO STREAMS. *Can. Field-Nat.* 97(1):99-102. Jan.-Mar. 1983. SFA 28(4)
[Ontario Minist. Nat. Resour., Nanticoke Fish Stud., P.O. Box 429, Part Dover, ON N0A 1N0, Canada]

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[Dep. Zool., Div. Ecol., Univ. New England, Armidale, N.S.W. 2351, Australia]

83-002569 Woolfenden, G. E. RARE, THREATENED, AND ENDANGERED VERTEBRATES OF SOUTHWEST FLORIDA AND POTENTIAL OCS ACTIVITY IMPACTS. *U.S. Fish Wildl. Serv.* FWS/OBS-82/03. x + 65p. Feb. 1983. SFA 28(4)
[Dep. Biol., Univ. South Fla., Tampa 33620]

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY

83-002570 Bourne, W. R. P. BIRDS, FISH AND OFFAL IN THE NORTH SEA. *Mar. Pollut. Bull.* 14(8):294-296. Aug. 1983. SFA 28(4)
[Dep. Zool., Univ. Aberdeen, Tillydrone Ave., Aberdeen, AB9 2TN, Scotland] Estimates that birds take 6-29% of North Sea fish production are examined in the light of revised census results, which on the same basis would suggest that it was 13-48%, and the fishery statistics, which suggest it is more likely to be 0.25-4%. Possible causes for the ten-fold discrepancy include inadequate past allowances for the food contained in the Atlantic inflow to the North Sea and its continued high productivity, the trophic level at which the birds feed, the variety of food which they take, and the movements of both the birds and their prey. It seems likely that the offal discarded by fishermen is more important to birds than the fish that they take, and unlikely that the activity of birds makes much difference to fishermen, but any effect is masked by the slow rate of change of bird populations.

83-002571 Frank, K. T. and W. C. Leggett. MULTISPECIES LARVAL FISH ASSOCIATIONS: ACCIDENT OR ADAPTATION? *Can. J. Fish. Aquatic Sci.* 40(6):754-762. June 1983. In English with French summ. SFA 28(4)
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83-002572 Gladfelter, W. B. and W. S. Johnson. FEEDING NICHE SEPARATION IN A GUILD OF TROPICAL REEF FISHES (HOLOCENTRIDAE). *Ecology* 64(3):552-563. June 1983. SFA 28(4)
[West Indies Lab., Fairleigh Dickinson Univ., Christiansted, St. Croix, 00820 U.S. Virgin Islands]

83-002573 Gordon, D. C., Jr. and C. Desplanque. DYNAMICS AND ENVIRONMENTAL EFFECTS OF ICE IN THE CUMBERLAND BASIN OF THE BAY OF FUNDY. *Can. J. Fish. Aquatic Sci.* 40(9):1331-1342. Sept. 1983. In English with French summ. SFA 28(4)
[Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada]

83-002574 Kayev, A. M. SOME QUESTIONS ON THE FACTORS INFLUENCING ABUNDANCE OF THE AUTUMN CHUM SALMON, *ONCORHYNCHUS KETA* (SALMONIDAE), FROM SAKHALIN AND ITURUP ISLAND. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)*

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

83-002574 CONTINUED 23(1):39-46. 1983. SFA 28(4)
[Sakhalin Br., Pac. Res. Inst. Sea Fish. Oceanogr., South Sakhalinsk, USSR] A comparison of the ecology of reproduction and the reproductive potential of the autumn chum, *Oncorhynchus keta*, from Sakhalin and Iturup Island was carried out. The longer fresh water period of life of the young and the poor conditions of early existence in the sea are accompanied both by an increase in fecundity and by acceleration of maturation. Moreover, the abundance of a population, of which a high reproductive potential is characteristic fluctuates most. The direct causes of fluctuations are considered with reference to the Iturup Island chum; the conditions of existence of the young in the coastal area are decisive.

83-002575 Marais, J. F. K. FISH ABUNDANCE AND DISTRIBUTION IN THE GAMTOOS ESTUARY WITH NOTES ON THE EFFECT OF FLOODS. *S. Afr. J. Zool.* 18(2):103-109. May 1983. In English with Afrikaans summ. SFA 28(4)
[Dep. Zool., Univ. Port Elizabeth, South Africa] Gill-nets were used on two occasions during 1980 and from January 1981 to January 1982 to determine the catch per unit effort for fishes in the Gamtoos estuary. The mean of the fish caught was 43 fish per net (33.3kg), which compares favourably with other larger systems like the Sundays, Bashee and Kei estuaries. All these estuaries are subject to regular floods and have relatively small mud-flats and *Spartina* beds in the mouth areas. Flood conditions, which occurred during seven months in 1981, caused reduced salinities and high turbidity throughout the estuary and were negatively correlated with catch returns. Mullet (Fam. Mugilidae) dominated catches numerically (12 per net) followed by kob *Argyrosomus hololepidotus* (11.4), sea-catfish *Tachysurus feliceps* (10.9) and leervis *Lichia amia* (5.2).

83-002576 Meffe, G. K. ECOLOGY OF SPECIES REPLACEMENT IN THE SONORAN TOPMINNOW (*POECILIOPSIS OCCIDENTALIS*) AND THE MOSQUITOFISH (*GAMBUSIA AFFINIS*) IN ARIZONA. *Ph.D. dissertation, Ariz. State Univ.* 156p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(3):720. Sept. 1983. SFA 28(4)
Extinction is common in geologic time, but rarely observed on shorter time scales. Species loss is due to biotic or abiotic change beyond tolerance limits of organisms; this change sometimes involves colonization by new predators or competitors. Although man has increased modern extinction rates, in cases where extirpations are due to biotic interactions with introduced species, the processes involved are similar to those operating in many prehistoric extinctions. As a result, modern extinctions via biotic processes may be approached as models of past events otherwise unobservable. Western North American fishes are especially vulnerable to extinction due to their isolated, often limited distributions. An environmental change is more likely to extirpate an entire species if its range is severely restricted, as is the case among much of this fauna. Man's activities in western America during the last century have tremendously accelerated extinction rates of aquatic organisms by habitat destruction and introduction of exotic fishes. The Sonoran topminnow (*Peociliopsis occidentalis*) was studied to determine mechanisms leading to local extirpation, as a model of western fish extinctions. The introduced mosquitofish (*Gambusia affinis*) is directly responsible for loss of topminnows through much of their native range. Laboratory and field experiments indicate that predation of juvenile topminnows is a major factor in decline of the species. Introduced parasites or diseases, hybridization, physiological stress, and resource competition are all dismissed as probable causes, for lack of supportive evidence. Periodic flooding has important consequences for this interaction. Floods are more deleterious to mosquitofish than topminnow populations, apparently due to behavioral differences with both genetic and learned components. Consequently, species replacement is slower in habitats that naturally flood,

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

83-002576 CONTINUED because predaceous mosquitofish are periodically reduced before they completely eliminate their prey. Management practices for the Sonoran topminnow include artificial propagation, restocking programs, removal of exotic fishes from natural habitats, and reconstruction of historic habitats. Recommendations for future management are discussed, and a greater recognition of genetic concerns is suggested. Other management potentials include concerted attempts at removal of exotics, public education, and legislative efforts aimed at reducing the spread of exotic fishes in Arizona.

83-002577 Middaugh, D. P.; H. W. Kohl and L. E. Burnett. CONCURRENT MEASUREMENT OF INTERTIDAL ENVIRONMENTAL VARIABLES AND EMBRYO SURVIVAL FOR THE CALIFORNIA GRUNION, *LEURESTHES TENUIS*, AND THE ATLANTIC SILVERSIDE, *MENIDIA MENIDIA* (PISCES: ATHERINIDAE). *Calif. Fish Game* 69(2):89-96. Apr. 1983. SFA 28(4)

[U.S. EPA, Environ. Res. Lab., Gulf Breeze, FL 32561] Concurrent daily measurements of environmental variables and embryo survival were made for two atherinid fishes: the California grunion, *Leuresthes tenuis*, observed at Blacks Beach, La Jolla, California; and the Atlantic silverside, *Menidia menidia*, observed at the Point of Pines, Edisto Island, South Carolina. Mesurements were made during April 1980. Both species spawned in the upper intertidal zone on high tides. *L. tenuis* eggs were deposited approximately 4 cm below the beach surface during nighttime. Subsequent sand deposition buried embryos to a depth of approximately 8 cm where they were protected from the thermal and desiccation stresses. Daily survival of incubating embryos averaged 97%. *M. menidia* utilized three spawning substrates: (i) abandoned crab burrows, (ii) detrital mats, and (iii) the stems and primary leaves of cordgrass, *Spartina alterniflora*. These substrates provided embryos with varying degrees of protection from thermal and desiccation stresses. Daily survival of embyros located 15 cm deep in abandoned crab burrows averaged 88%. Survival was less, 76%, at the entrance. Daily survival averaged 94% at the surface of detrital mats and at the axis of stems and primary leaves of cordgrass. Survival was lower at other locations on these substrates.

83-002578 Peterman, R. M. and R. D. Routledge. EXPERIMENTAL MANAGEMENT OF OREGON COHO SALMON (*ONCORHYNCHUS KISUTCH*): DESIGNING FOR YIELD OF INFORMATION. *Can. J. Fish. Aquatic Sci.* 40(8):1212-1223. Aug. 1983. In English with French summ. SFA 28(4)

[Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada]

83-002579 Peterson, R. H. and D. J. Martin-Robichaud. EMBRYO MOVEMENTS OF ATLANTIC SALMON (*SALMO SALAR*) AS INFLUENCED BY pH, TEMPERATURE, AND STATE OF DEVELOPMENT. *Can. J. Fish. Aquatic Sci.* 40(6):777-782. June 1983. In English with French summ. SFA 28(4)

[Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

83-002580 Reiser, D. W. and R. G. White. EFFECTS OF COMPLETE REDD DEWATERING ON SALMONID EGG-HATCHING SUCCESS AND DEVELOPMENT OF JUVENILES. *Trans. Am. Fish. Soc.* 112(4):532-540. July 1983. SFA 28(4)

[Bechtel Group, Inc., Environ. Sci. Dep., 50 Beale St., P.O. Box 3965, San Francisco, CA 94119]

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

83-002581 Schlesinger, D. A. and H. A. Reiger. RELATIONSHIP BETWEEN ENVIRONMENTAL TEMPERATURE AND YIELDS OF SUBARTIC AND TEMPERATE ZONE FISH SPECIES. *Can. J. Fish. Aquatic Sci.* 40(10):1829-1837. Oct. 1983. In English with French summ. SFA 28(4)
[Inst. Environ. Stud., Univ. Toronto, Toronto, ON M5S 1A4, Canada]

83-002582 Ulanowicz, R. E.; M. Liaquat Ali; A. Vivian; D. R. Heinle; W. A. Richkus and J. K. Summers. IDENTIFYING CLIMATIC FACTORS INFLUENCING COMMERCIAL FISH AND SHELLFISH LANDINGS IN MARYLAND. *NOAA Fish. Bull.* 80(3):611-619. July 1982. SFA 28(4)
[Univ. Md., Chesapeake Biol. Lab., Solomons 20688]

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83-002583 Beckham, E. C. III. SYSTEMATICS, REDESCRIPTION, AND GEOGRAPHIC VARIATION OF THE BLACKSIDE DARTER, *PERCINA MACULATA* (PISCES; PERCIDAE). *Ph.D. dissertation, La. State Univ. Agric. Mech. Coll.* 77p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(4):1024. Oct. 1983. SFA 28(4)

83-002584 Bertelsen, E. NOTES ON LINOPHRYNIDAE VII: NEW RECORDS OF THE DEEPSEA ANGLERFISH *LINOPHRYNE INDICA* (BRAUER, 1902), A SENIOR SYNONYM FOR *LINOPHRYNE CORYMBIFERA* REGAN AND TREWAVAS, 1932 (PISCES, CERATIOIDEI). *Steenstrupia* 7(1):1-14. 20 Aug. 1981. SFA 28(4)
[Zool. Mus., Univ. Copenhagen, Universitetsparken 15, DK-2100 Copenhagen, Ø, Denmark]

83-002585 Cousseau, M. B. REVISIÓN TAXONÓMICA Y ANÁLISIS DE LOS CARACTERES MORFOMÉTRICOS Y MERÍSTICOS DE LA SARDINA FUEGUINA, *SPRATTUS FUEGENSIS* (JENYNS, 1892) (PISCES, CLUPEIDAE). [TAXONOMIC REVISION AND ANALYSIS OF MORPHOMETRIC AND MERISTIC CHARACTERS OF THE SARDINA FUEGUINA, *SPRATTUS FUEGENSIS* (JENYNS, 1892) (PISCES, CLUPEIDAE).] *Rev. Invest. Desarr. Pesq.* No. 3. p.77-94. 1982. In Spanish with English summ. SFA 28(4)
[INIDEP, Mar del Plata, Argentina]

83-002586 Dawson, C. E. SYNOPSIS OF THE INDO-PACIFIC PIPEFISH GENUS *SIOKUNICHTHYS* (SYNGNATHIDAE), WITH DESCRIPTION OF *S. NIGROLINEATUS* N. SP. *Pac. Sci.* 37(1):49-63. Jan. 1983. SFA 28(4)
[Gulf Coast Res. Lab. Mus., Ocean Springs, MS 39564]

83-002587 Dawson, C. E. WESTERN ATLANTIC OCCURRENCE OF THE GENUS *MINYICHTHYS* (PISCES: SYNGNATHIDAE), WITH DESCRIPTION OF *M. INUSITATUS* N. SP. *Copeia* 1983(3):774-776. 1983. SFA 28(4)
[Gulf Coast Res. Lab. Mus., Ocean Springs, MS 39564]

83-002588 Fernholm, B. and A. Wheeler. LINNAEAN FISH SPECIMENS IN THE SWEDISH MUSEUM OF NATURAL HISTORY, STOCKHOLM. *Zool. J. Linn. Soc.* 78(3):199-286. July 1983. SFA 28(4)
[Res. Dep., Swed. Mus. Nat. Hist., S-10405 Stockholm, Sweden]

IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

83-002589 Greenwood, P. H. ON *MACROPLEURODUS*, *CHILOTILAPIA* (TELEOSTEI, CICHLIDAE), AND THE INTERRELATIONSHIPS OF AFRICAN CICHLID SPECIES FLOCKS. *Bull. Br. Mus. (Nat. Hist.) Zool. Ser.* 45(4):209-231. 25 Aug. 1983. SFA 28(4)
[Dep. Zool., Br. Mus. (Nat. Hist.), Cromwell Rd., London SW7 5BD, England]

83-002590 Hardy, G. S. A REVISION OF THE FISHES OF THE FAMILY PENTACEROTIDAE (PERCIFORMES). *N.Z. J. Zool.* 10(2):177-220. 1983. SFA 28(4)
[Natl. Mus. N.Z., P.B., Wellington, New Zealand]

83-002591 Hardy, G. S. THE STATUS OF *TORQUIGENER HYPSELOGENEION* (BLEEKER) (TETRAODONITFORMES: TETRAODONTIDAE) AND SOME RELATED SPECIES, INCLUDING A NEW SPECIES FROM HAWAII. *Pac. Sci.* 37(1):65-74. Jan. 1983. SFA 28(4)
[Natl. Mus. N.Z., P.B., Wellington, New Zealand]

83-002592 Howes, G. ADDITIONAL NOTES ON BARILIINE CYPRINID FISHES. *Bull. Br. Mus. (Nat. Hist.) Zool. Ser.* 45(2):95-101. 28 July 1983. SFA 28(4)
[Dep. Zool., Br. Mus. (Nat. Hist.), Cromwell Road, London SW7 5BD, England]

83-002593 Johnson, G. D. *NIPHON SPINOSUS*: A PRIMITIVE EPINEPHELINE SERRANID, WITH COMMENTS ON THE MONOPHYLY AND INTRARELATIONSHIPS OF THE SERRANIDAE. *Copeia* 1983(3):777-787. 1983. SFA 28(4)
[Mar. Resour. Res. Inst., P.O. Box 12559, Charleston, SC 29412]

83-002594 Kharin, V. Y. and V. A. Dudarev. A NEW SPECIES OF THE GENUS *CAPRODON* TEMMINCK ET SCHLEGEL, 1843 (SERRANIDAE) AND SOME REMARKS ON THE COMPOSITION OF THE GENUS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(1):20-25. 1983. SFA 28(4)
[TINRO, Vladivostok, USSR]

83-002595 Leis, J. M. CORAL REEF FISH LARVAE (LABRIDAE) IN THE EAST PACIFIC BARRIER. *Copeia* 1983(3):826-828. 1983. SFA 28(4)
[Australian Mus., P.O. Box A285, Sydney, NSW, Australia]

83-002596 MacDonald, C. M. POPULATION, TAXONOMIC AND EVOLUTIONARY STUDIES ON MARINE FISHES OF THE GENUS *ARRIPIS* (PERCIFORMES: ARRIPIDAE). *Bull. Mar. Sci.* 33(3):780. July 1983. Abstract only. SFA 28(4)
[Fish. Wildl. Div., Minist. Conserv., East Melbourne, Victoria, Australia 3002]

83-002597 McEachran, J. D. RESULTS OF THE RESEARCH CRUISES OF FRV "WALTHER HERWIG" TO SOUTH AMERICA. LXI. REVISION OF THE SOUTH AMERICAN SKATE GENUS *PSAMMOBATIS* GÜNTHER, 1870 (ELASMOBRACHII: RAJIFORMES, RAJIDAE). *Arch. Fischereiwiss.* 34(1):23-80. July 1983. SFA 28(4)
[Dep. Wildl. Fish. Sci., Tex. A & M Univ., College Station 77843]

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83-002598 Miller, R. R. and C. Hubbs. DESIGNATION OF A LECTOTYPE FOR THE AMAZON MOLLY, *POECILIA FORMOSA* (PISCES: POECILIIDAE). *Copeia* 1983(3):816-817. 1983. SFA 28(4)
[Mus. Zool., Univ. Mich., Ann Arbor 48109]

83-002599 Olney, J. E.; G. C. Grant; F. E. Schultz; C. L. Cooper and J. Hageman. PTERYGIOPHORE-INTERDIGITATION PATTERNS IN LARVAE OF FOUR *MORONE* SPECIES. *Trans. Am. Fish. Soc.* 112(4):525-531. July 1983. SFA 28(4)
[Va. Inst. Mar. Sci., Coll. William and Mary, Gloucester Point, VA 23062]

83-002600 Otto, R. G. and J. A. Boggs. FISH EGGS AND LARVAE OF THE CHESAPEAKE BAY: OBSERVATIONS ON THE PROBLEM OF IDENTIFYING FIELD MORTALITIES OF STRIPED BASS (*MORONE SAXATILIS*) LARVAE FROM PRESERVED SAMPLES. *Estuaries* 6(2):167-171. June 1983. SFA 28(4)
[R.G. Otto and Assoc., 1040 N. Calvert St., Baltimore, MD 21202] This study considered the rate at which striped bass larvae disintegrate following death as well as the ability of experienced taxonomists to distinguish larvae which were live or dead on collection from preserved samples. The rate of disintegration was dependent on age (size) of the larvae with pro-larvae being unrecognizable in 8 to 16 h following death (17 to 19°C). Post-larvae decomposed somewhat more slowly, but were unrecognizable as to species after 16 h. Experienced taxonomists were unable to distinguish pro-and post-larvae which had been live or dead prior to preservation. However, the viability of metamorphosed larvae could readily be distinguished.

83-002601 Papaconstantinou, C. [ON THE *PARABLENNIUS ZVONIMIRI PONTICUS* (SLASTENENKO, 1934) FROM THE BLACK SEA.] *Thallassographica* 5(2):93-103. In Greek with English summ. SFA 28(4)
Inst. Oceanogr. Fish. Res., Athens, Greece]

83-002602 Parin, N. V. and Y. I. Kukuyev. REESTABLISHMENT OF THE VALIDITY OF *LAMPRIS IMMACULATA* GILCHRIST AND THE GEOGRAPHICAL DISTRIBUTION OF LAMPRIDAE. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(1):1-12. 1983. SFA 28(4)
[Inst. Oceanol., USSR Acad. Sci., Moscow, USSR] On the basis of a study of three opah specimens, caught in the Scotia Sea north of the Falklands (Malvinas) and in the southeastern Pacific and of an analysis of supplementary reports and published data, the existence of two species in the genus *Lampris*, previously considered monotypic, is shown. One of the species, *L. guttatus*, is widespread in the World Ocean; the second, for which the name *L. immaculatus* is reinstated, is encountered only in the high and middle latitudes of the southern Hemisphere. The main diagnostic differences between the species are body shape and coloration, body depth and relative position of pectoral and pelvic fins.

83-002603 Phelps, S. R. and F. W. Allendorf. GENETIC IDENTITY OF PALLID AND SHOVELNOSE STURGEON (*SCAPHIRHYNCHUS ALBUS* AND *S. PLATORYNCHUS*). *Copeia* 1983(3):696-700. 1983. SFA 28(4)
[Dep. Zool., Univ. Mont., Missoula 59812] Pallid and shovelnose sturgeon are electrophoretically indistinguishable at 37 loci. They share the same allele at 34 monomorphic loci and have similar allelic frequencies at three polymorphic loci. This complete lack of genetic divergence between species is unusual among fish that have been studied. The close genetic similarity is apparently due to recent or incomplete reproductive isolation accompanied by rapid morphological differentiation.

IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

83-002604 Relyea, K. A SYSTEMATICS STUDY OF TWO SPECIES COMPLEXES OF THE GENUS *FUNDULUS* (PISCES: CYPRINODONTIDAE). *Bull. Fla. State Mus. Biol. Sci.* 29(1):1-64. 1983. In English with Spanish summ. SFA 28(4)
[Dep. Zool., Univ. Kuwait, Kuwait]

83-002605 Rupp, J. H. *ERILEPIS ZONIFER* THE "MYSTERY FISH". *Am. Assoc. Zool. Parks Aquariums Reg. Conf. Proc.* 1983:58-62. 1983. SFA 28(4)
[Point Defiance Zoo and Aquarium, Tacoma, WA]

83-002606 Staeck, W. *LAMPROLOGUS BUESCHERI* N.SP. FROM THE ZAMBIAN PART OF LAKE TANGANYIKA (PICES: CICHLIDAE). *Senckenb. Biol.* 63(5-6):325-328. 20 July 1983. In English with German summ. SFA 28(4)
[Beymestr. 8, D-1000 Berlin 41, West Germany]

83-002607 Tianyou, F. and Y. Miaorong. [ON A NEW SPECIES OF THE FAMILY COBITIDAE *LEPTOBOTIA MICROPHTHALMA*, SP. NOV.] *Zool. Res.* 4(2):121-124. 1983. In Chinese with English summ. SFA 28(4)
[Sichuan Agric. Coll., China]

83-002608 Weng, H. T. IDENTIFICATION, HABITATS AND SEASONAL OCCURRENCE OF JUVENILE WHITING (SILLAGINIDAE) IN MORETON BAY, QUEENSLAND. *J. Fish Biol.* 23(2):195-200. Aug. 1983. SFA 28(4)
[Queensland Dep. Primary Indus., South. Fish. Res. Cent., P.O. Box 76, Deception Bay, Queensland 4508, Australia] Three sympatric whiting species (Sillaginidae)--sand whiting, *Sillago ciliata*, golden-lined whiting, *Sillago analis*, and trumpeter whiting, *Sillago maculata*, are common in Moreton Bay, Queensland. Their identification, habitats and seasonal occurrence of juveniles are studied. A key to identification of these species is provided. Juveniles of the three species inhabit shallow shores including lower sections of creeks and rivers; but *S. ciliata* prefer sandy substrates with less than 1 m depth and *S. analis* favour muddy-sandy substrates also with less than 1 m depth, while *S. maculata* juveniles stay in muddy-sand to muddy substrates at 1-3 m depth. *Sillago analis* juveniles appear at the waters' edge from October to May each year.

83-002609 Williams, J. T. TAXONOMY AND ECOLOGY OF THE GENUS *CHASMODES* (PISCES: BLENNIIDAE) WITH A DISCUSSION OF ITS ZOOGEOGRAPHY. *Bull. Fla. State Mus. Biol. Sci.* 29(2):65-101. 1983. In English with Spanish summ. SFA 28(4)
[Div. Fish., Natl. Mus. Nat. Hist., Smithsonian Inst., Washington, DC 20560]

PARASITES AND DISEASES-GENERAL

83-002610 Arai, H. P. and D. R. Mudry. PROTOZOAN AND METAZOAN PARASITES OF FISHES FROM THE HEADWATERS OF THE PARSNIP AND MCGREGOR RIVERS, BRITISH COLUMBIA: A STUDY OF POSSIBLE PARASITE TRANSFAUNATIONS. *Can. J. Fish. Aquatic Sci.* 40(10):1676-1684. Oct. 1983. In English with French summ. SFA 28(4)
[Dep. Biol., Univ. Calgary, Calgary, AB T2N 1N4, Canada]

83-002611 Hooper, J. N. A. PARASITES OF ESTUARINE AND OCEANIC FLATHEAD FISHES (FAMILY PLATYCEPHALIDAE) FROM NORTHERN NEW SOUTH WALES. *Aust. J. Zool. Suppl. Ser.* No. 90. 69p. 13 July 1983. SFA 28(4)

PARASITES AND DISEASES-GENERAL (CONTINUED)

83-002611 CONTINUED
[Div. Nat. Sci., North Territory Mus. Arts Sci., P.O. Box 4646, Darwin, N.T. 5794, Australia]

83-002612 Nagai, A.; Y. Aizawa; S. Ono and H. Nagura. [ANTIGENIC PROTEIN UPTAKE IN THE GUT OF RAINBOW TROUT *SALMO GAIRDNERI*.] *J. Fac. Mar. Sci. Technol. Tokai Univ.* No. 16. p.235-247. 1983. In Japanese with English summ. SFA 28(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan 424]

83-002613 Roubal, F. R.; J. Armitage and K. Rohde. TAXONOMY OF METAZOAN ECTOPARASITES OF SNAPPER, *CHRYSOPHRYS AURATUS* (FAMILY SPARIDAE), FROM SOUTHERN AUSTRALIA, EASTERN AUSTRALIA AND NEW ZEALAND. *Aust. J. Zool. Suppl. Ser.* No. 94. 68p. 15 July 1983. SFA 28(4)
[Dep. Zool., Univ. New England, Armidale, N.S.W. 2351, Australia]

BACTERIAL DISEASES

83-002614 Austin, B. VACCINE FOR THE CONTROL OF VIBRIOSIS IN EELS. *Vet. Rec.* 113(17):394-395. 22 Oct. 1983. SFA 28(4)
[Fish Dis. Lab., Weymouth, Dorset DT4 8UB, England]

83-002615 Chen, M. F.; J. S. Rohovec and J. L. Fryer. EFFECT OF METHOTREXATE, KENALOG, AND CYCLOPHOSPHAMIDE ON THE ANTIBODY RESPONSE OF STEELHEADS TO *AEROMONAS SALMONICIDA*. *Trans. Am. Fish. Soc.* 112(4):561-564. July 1983. SFA 28(4)
[Dep. Microbiol., Oreg. State Univ., Corvallis 97331]

83-002616 Fukumori, F.; F. Nagayama and S. Horie. [LYTIC AND LETHAL EFFECT OF CULTURE SUPERNATANT OF *PSEUDOMONAS* SP. AGAINST FISH PATHOGENIC *VIBRIO ANGUILLARUM*.] *Bull. Jpn. Soc. Sci. Fish.* 49(7):1109-1116. In Japanese with English summ. SFA 28(4)
[Tokyo Univ. Fish., Konan 4, Minato, Tokyo 108, Japan]

83-002617 Green, M. and B. Austin. THE IDENTIFICATION OF *YERSINIA RUCKERI* AND ITS RELATIONSHIP TO OTHER REPRESENTATIVES OF THE ENTEROBACTERIACEAE. *Aquaculture* 34(3-4):185-192. Aug. 1983. SFA 28(4)
[Fish. Dis. Lab., Weymouth, Dorset DT4 8UB, England]

83-002618 Horne, M. T. and A. Baxendale. THE ADHESION OF *VIBRIO ANGUILLARUM* TO HOST TISSUES AND ITS ROLE IN PATHOGENESIS. *J. Fish Dis.* 6(5):461-471. Sept. 1983. SFA 28(4)
[Inst. Aquacult., Univ. Stirling, Stirling FK9 4LA, Scotland]

83-002619 Johnson, K. A. and D. F. Amend. EFFICACY OF *VIBRIO ANGUILLARUM* AND *YERSINIA RUCKERI* BACTERINS APPLIED BY ORAL AND ANAL INTUBATION OF SALMONIDS. *J. Fish Dis.* 6(5):473-476. Sept. 1983. SFA

BACTERIAL DISEASES (CONTINUED)

83-002619 CONTINUED 28(4)
[D. F. Amend: Dep. Med., Sch. Vet. Med., Univ. Calif., Davis 95616]

83-002620 Kawai, K. and R. Kusuda. [EFFICACY OF THE LIPOPOLYSACCHARIDE VACCINE AGAINST VIBRIOSIS IN CULTURED AYU.] *Bull. Jpn. Soc. Sci. Fish.* 49(4):511-514. Apr. 1983. In Japanese with English summ. SFA 28(4)
[Fish. Dis. Lab., Fac. Agric., Kochi Univ., Nankoku, Kochi 783, Japan]

83-002621 Nomura, T. [INCIDENCE OF *AEROMONAS SALMONICIDA* AMONG ANADROMOUS SALMONIDS, 1980-1982.] *Sci. Rep. Hokkaido Salmon Hatchery* No. 37. p. 63-65. Mar. 1983. In Japanese. SFA 28(4)
[Hokkaido Salmon Hatchery, Nakanoshima, Toyohiaku, Sapporo, Hokkaido, Japan]

83-002622 Nomura, T.; T. Kimura; I. Shimizu and K. Nara. [INCIDENCE OF *AEROMONAS SALMONICIDA* AMONG CHUM SALMON, *ONCORHYNCHUS KETA*, IN CHITOSE RIVER.] *Sci. Rep. Hokkaido Salmon Hatchery* No. 37. p. 53-61. Mar. 1983. In Japanese. SFA 28(4)
[Hokkaido Salmon Hatchery, Nakanoshima, Toyohiaku, Sapporo, Hokkaido, Japan]

83-002623 Pauley, G. B. and C. M. Heartwell. IMMUNE HYPERSENSITIVITY IN THE CHANNEL CATFISH, *ICTALURUS PUNCTATUS* (RAFINESQUE). *J. Fish Biol.* 23(2):187-193. Aug. 1983. SFA 28(4)
[Wash. Coop. Fish. Res. Unit, Coll. Ocean Fish. Sci., Univ. Wash., Seattle 98195] Channel catfish, *Ictalurus punctatus*, exhibited passive cutaneous anaphylaxis (PCA) when sensitized with *Flexibacter columnaris* antiserum produced in channel catfish (the first record of PCA in any fish), but not when sensitized with homologous antiserum against channel catfish virus. Channel catfish did not give delayed skin hypersensitivity responses after immunization with either channel catfish virus or *F. columnaris*.

83-002624 Rehulka, J. and O. Mráz. COLUMNAROSIS IN RAINBOW TROUT (*SALMO GAIRDNERI* R.) IN CZECHOSLOVAKIA. *Acta Vet. (Brno)* 51(1-4):125-137. 1982. SFA 28(4)
[Fish. Res. Inst., Lab. Ostrava, 701 00 Ostrava, Czechoslovakia]

83-002625 Sakanari, J. A.; C. A. Reilly and M. Moser. TUBERCULAR LESIONS IN PACIFIC COAST POPULATIONS OF STRIPED BASS. *Trans. Am. Fish. Soc.* 122(4):565-566. July 1983. SFA 28(4)
[Cent. Coastal Mar. Stud., Univ. Calif., Santa Cruz 95064]

83-002626 Tajima, K.; T. Takahashi; Y. Ezura and T. Kimura. [STUDIES ON THE VIRULENT FACTORS PRODUCED BY *AEROMONAS SALMONICIDA*, A CAUSATIVE AGENT OF FURUNCULOSIS IN SALMONIDAE--I. PURIFICATION OF THE EXTRACELLULAR PROTEASE OF *AEROMONAS SALMONICIDA* AR-4 (EFDL).] *Bull. Fac. Fish. Hokkaido Univ.* 34(2):104-110. June 1983. In Japanese with English summ. SFA 28(4)
[Lab. Microbiol., Fac. Fish., Hokkaido Univ., Hakodate, Japan]

BACTERIAL DISEASES (CONTINUED)

83-002627 Tajima, K.; T. Takahashi; Y. Ezura and T. Kimura. [STUDIES ON THE VIRULENT FACTORS PRODUCED BY *AEROMONAS SALMONICIDA*, A CAUSATIVE AGENT OF FURUNCULOSIS IN SALMONIDAE--II. STUDIES ON THE PATHOGENICITY OF THE PROTEASE OF *AEROMONAS SALMONICIDA* AR-4 (EFDL) ON YAMABE (*ONCORHYNCHUS MASOU* F. *ISHIKAWAI*) AND GOLDFISH (*CARASSIUS AURATUS*), AND THE SUBSTANCE WHICH EXHIBITS CYTOTOXIC EFFECT IN RTG-2 (RAINBOW TROUT GONAD) CELLS.] *Bull. Fac. Fish. Hokkaido Univ.* 34(2):111-123. June 1983. In Japanese with English summ. SFA 28(4)

[Lab. Microbiol., Fac. Fish., Hokkaido Univ., Hakodate, Japan] Previously we reported on the purification of the extracellular protease from the supernatant culture fluid of *A. salmonicida* Ar-4 (EFDL) by acetone precipitation, ammonium sulfate fractionation, DEAE-cellulose and DEAE-sephadex A-50 column chromatography. In this paper, we examined the pathogenicity of the protease of *A. salmonicida* Ar-4 (EFDL) at each stage of the purification on yamabe (*O. masou f. ishikawai*) and goldfish (*C. auratus*), and then studied the cytotoxic substance other than the protease which was detected in process of purification. In conclusion, we certified that the extrcellular protease of *A. salmonicida* Ar-4 (EFDL) was a causative agent of furunculosis and we considered the cytotoxic substance to be a glycoprotein functioning as a co-factor of toxicity of the protease.

83-002628 Tyutikov, F. M.; V. V. Yesipova; B. A. Rebentish; I. A. Bespalova; N. I. Alexandrushkina; V. V. Galchenko and A. S. Tikhonenko. BACTERIOPHAGES OF METHANOTROPHS ISOLATED FROM FISH. *Appl. Environ. Microbiol.* 46(4):917-924. Oct. 1983. SFA 28(4)

[All-Union Res. Inst. Genet. Sel. Indus. Microorgan., Inst. Molec. Biol., Moscow State Univ., Moscow, USSR]

FUNGAL DISEASES

83-002629 Pickering, A. D. and J. Duston. ADMINISTRATION OF CORTISOL TO BROWN TROUT, *SALMO TRUTTA* L., AND ITS EFFECTS ON THE SUSCEPTIBILITY TO *SAPROLEGNIA* INFECTION AND FURUNCULOSIS. *J. Fish Biol.* 23(2):163-175. Aug. 1983. SFA 28(4)

[Freshwater Biol. Assoc., Ferry House, Far Sawrey, Ambleside, Cumbria, England] Oral administration and intraperitoneal implantation can be used to administer cortisol to the brown trout. Both techniques produce a dose-dependent increase in plasma cortisol concentration and the experimental procedures reduce the stress response in control fish to a minimum level. The plasma levels of the steroid are within the physiological range for the fish and the time of the response to acute oral administration is similar to that for such stresses as crowding, pollution and confinement. The evidence strongly indicates that elevated cortisol levels can significantly increase the susceptibility of salmonid fish to a wide range of infectious diseases including furunculosis and fungal infection. The present study has shown that this can occur at cortisol levels within the normal physiological range of the fish.

PROTOZOAN DISEASES

83-002630 Aguirre, M.; D. A. Conroy; G. Conroy and J. M. Torrealba. BLACK SPOT DISEASE, A MYXOSPORIDIOSIS AFFECTING SILVER MULLET (*MUGIL CUREMA* VAL.) IN VENEZUELA. *Riv. It. Piscic. Ittiop.* 18(2):61-69. Apr.-June

PROTOZOAN DISEASES (CONTINUED)

83-002630 CONTINUED 1983. In English and Italian. SFA 28(4)
[A. D. Conroy: Secc. Ictiopatol., Fac. Cienc. Vet., Univ. Cent. Venezuela, Apt. Correos N. 4563, Maracay 2101, Arajua, Venezuela]

83-002631 Buchanan, D. V.; J. E. Sanders; J. L. Zinn and J. L. Fryer. RELATIVE SUSCEPTIBILITY OF FOUR STRAINS OF SUMMER STEELHEAD TO INFECTION BY *CERATOMYXA SHASTA*. *Trans. Am. Fish. Soc.* 112(4):541-543. July 1983. SFA 28(4)
[Oreg. Dep. Fish. Wildl., Corvallis 97331]

83-002632 Copland, J. W. THE PATHOLOGY OF *MYXIDIUM GIARDI* CÉPÈDE, 1906 INFECTIONS IN WILD AND CULTURED EELS, *ANGUILLA ANGUILLA* L. *J. Fish Dis.* 6(5):451-460. Sept. 1983. SFA 28(4)
[Dep. Agric., Reg. Vet. Lab., P.O. Box 388, Benalla, Victoria 3672, Australia]

83-002633 De Jonckheere, J. F.; C. Mélard and J. C. Philippart. APPEARANCE OF PATHOGENIC *NAEGLERIA FOWLERI* (AMOEBIDA, VAHLKAMPFIIDAE) IN ARTIFICIALLY HEATED WATER OF A FISH FARM. *Aquaculture* 35(1):73-78. Sept. 1983. SFA 28(4)
[Inst. Hygiëne Epidemiol, B-1050 Brussels, Belgium] The occurrence of *Naegleria fowleri* is reported from a fish farm receiving warm water (±12°C above ambient) from a power station. The pathogen disappeared when the supply of heated water was stopped. The importance of monitoring thermally polluted waters for the presence of the pathogen is emphasized.

83-002634 Lom, J. and G. Schubert. ULTRASTRUCTURAL STUDY OF *PISCINOODINIUM PILLULARE* (SCHÄPERCLAUS, 1954) LOM, 1981 WITH SPECIAL EMPHASIS ON ITS ATTACHMENT TO THE FISH HOST. *J. Fish Dis.* 6(5):411-428. Sept. 1983 SFA 28(4)
[Inst. Parasitol., Czeck. Acad. Sci., Flemingovo nám. 2, 166 32 Praha 6, Czechoslovakia]

83-002635 Ratliff, D. E. *CERATOMYXA SHASTA*: LONGEVITY, DISTRIBUTION, TIMING, AND ABUNDANCE OF THE INFECTIVE STAGE IN CENTRAL OREGON. *Can. J. Fish. Aquatic Sci.* 40(10):1622-1632. Oct. 1983. In English with French summ. SFA 28(4)
[Portland General Electric Co., Dep. Environ. Sci. Madras, OR 97741]

83-002636 Woo, P. T. K. and S. D. Wehnert. DIRECT TRANSMISSION OF A HEMOFLAGELLATE, *CRYPTOBIA SALMOSITICA* (KINETOPLASTIDA: BODONINA) BETWEEN RAINBOW TROUT UNDER LABORATORY CONDITIONS. *J. Protozool.* 30(2):334-337. May 1983. SFA 28(4)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

VIRAL DISEASES

83-002637 Agius, C.; A. Richardson and W. Walker. FURTHER OBSERVATIONS ON THE CO-CULTIVATION METHOD FOR ISOLATING INFECTIOUS PANCREATIC NECROSIS VIRUS FROM ASYMPTOMATIC CARRIER RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON.

VIRAL DISEASES (CONTINUED)

83-002637 CONTINUED *J. Fish Dis.* 6(5):477-480. Sept. 1983. SFA 28(4)
[Sch. Chem. Phys. Sci., Kingston Polytech., Penrhyn Rd., Kingston-upon-Thames KT1 2EE, England]

83-002638 Dixon, P. F. and B. J. Hill. INACTIVATION OF INFECTIOUS PANCREATIC NECROSIS VIRUS FOR VACCINE USE. *J. Fish Dis.* 6(5):399-409. Sept. 1983. SFA 28(4)
[MAFF, Fish Dis. Lab., The Nothe, Weymouth, Dorset DT4 84B, England] Formalin and β-propiolactone (BPL) were compared for efficacy in inactivating infectious pancreatic necrosis virus (IPNV) for vaccine use. Incubation with a 1:200 dilution of formalin at 20°C for four days or longer, or a 1:200 dilution of BPL at 4°C for six days of longer, completely inactiviated the virus infectivity. However, whereas treatment with formalin caused only a slight reduction in antigenicity as titrated by *in vitro* tests, treatment with BPL destroyed over 50% of the antigenicity of the virus. Virus inactivated with formalin also proved highly effective at inducing high titres of neutralizing antibody in trout.

83-002639 Mulcahy, D.; R. Pascho and C. K. Jenes. MORTALITY DUE TO INFECTIOUS HEMATOPOIETIC NECROSIS OF SOCKEYE SALMON (*ONCORHYNCHUS NERKA*) FRY IN STREAMSIDE EGG INCUBATION BOXES. *Can. J. Fish. Aquatic Sci.* 40(9):1511-1516. Sept. 1983. In English with French summ. SFA 28(4)
[U.S. FWS, Bldg. 204, Naval Stn., Seattle, WA 98115]

83-002640 Robin, J.; C. Larivière-Durand and J. Bernard. THE CHEMICAL COMPOSITION OF LYMPHOCYSTIS DISEASE VIRUS OF FISH. *Rev. Can. Biol. Exp.* 42(2):173-176. July 1983. SFA 28(4)
[Dep. Biol., Fac. Sci., Univ. Sherbrooke, Sherbrooke, PQ J1K 2R1, Canada] After concentration with PEG-6000 and purification on a metrizamide gradient, the Lymphocystis Disease Virus (LDV) can be shown as a particle with a chemical composition of 1.6% DNA, 42.3% protein and 17.1% lipid, most of them being phospholipids. Sugars might constitute a major portion of the 39% unidentified components.

OTHER DISEASES AND PARASITES

83-002641 Agrawal, N. K. and C. L. Mahajan. PATHOLOGY OF VITAMIN B-6 DEFICIENCY IN *CHANNA* (=*OPHIOCEPHALUS*) *PUNCTATUS* BLOCH. *J. Fish Dis.* 6(5):439-450. Sept. 1983. SFA 28(4)
[C. L. Mahajan: Aquatic Fish Biol. Lab., Dep. Zool., Univ. Rajastan, Jaipur 302004, India]

83-002642 Bamber, R. N.; R. Glover; P. A. Henderson and A. W. H. Turnpenny. DIPLOSTOMIASIS IN THE SAND SMELT, *ATHERINA PRESBYTER* (CUVIER), POPULATION AT LAWLEY POWER STATION. *J. Fish Biol.* 23(2):201-210. Aug. 1983. SFA 28(4)
[Mar. Biol. Unit, CEGB, Fawley, Southampton, Hants. SO4 1TW, England]

83-002643 Baohua, W. and W. Shuxia. [NINE NEW SPECIES OF MONOGENETIC TREMATODES FROM FRESHWATER FISHES OF ZHEJIANG PROVINCE.] *Zool. Res.* 4(2):125-134. 1983. In Chinese with English summ. SFA 28(4)
[Sect. Zool., Dep. Biol., Hangzhou Univ., China]

OTHER DISEASES AND PARASITES (CONTINUED)

83-002644 Black, G. A. ORIGIN, DISTRIBUTION, AND POSTGLACIAL DISPERSAL OF A SWIMBLADDER NEMATODE, *CYSTIDICOLA STIGMATURA*. *Can. J. Fish. Aquatic Sci.* 40(8):1244-1253. Aug. 1983. In English with French summ. SFA 28(4)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

83-002645 Bouck, G. R. and R. E. King. TOLERANCE TO GAS SUPERSATURATION IN FRESH WATER AND SEA WATER BY STEELHEAD TROUT, *SALMO GAIRDNERI* RICHARDSON. *J. Fish Biol.* 23(3):293-300. Sept. 1983. SFA 28(4)
[Div. Fish. Wildl., Bonneville Power Admin., P.O. Box 3621, Portland, OR 97208] The euryhaline status of steelhead trout, *Salmo gairdneri*, smolts was challenged in sea water for 2 weeks after which half of the total fish population was returned to fresh water. Acclimation continued and created two test populations in 29°/oo sea water and fresh water. Subsequently these fish were exposed in fresh water or sea water to approximately equal hyperbaric dissolved total gas pressures (ΔP) of 190 mm Hg or about 125°/oo of barometric pressure. Sea water was easier to supersaturate with air and required only about 10% of the entrained air which was required in fresh water at the same temperature and pressure. Mean time to first mortality was sooner in sea water. Mean times to mortality (10-50%) were not significantly different between fresh water and sea water, but there was a noticeable trend for longer survival in fresh water.

83-002646 Boyce, N. P. and W. C. Clarke. *EUBOTHRIUM SALVELINI* (CESTODA: PSEUDOPHYLLIDEA) IMPAIRS SEAWATER ADAPTATION OF MIGRANT SOCKEYE SALMON YEARLINGS (*ONCORHYNCHUS NERKA*) FROM BABINE LAKE, BRITISH COLUMBIA. *Can. J. Fish. Aquatic Sci.* 40(6):821-824. June 1983. In English with French summ. SFA 28(4)
[Dep. Fish. Oceans, Resour. Res. Br., Ottawa, ON K1A 0E6, Canada]

83-002647 Brunson, M. W.; H. R. Robinette; P. R. Bowser and T. L. Wellborn, Jr. NUTRITIONAL GILL DISEASE ASSOCIATED WITH STARTER FEEDS FOR CHANNEL CATFISH FRY. *Prog. Fish-Cult.* 45(2):119-120. Apr. 1983. SFA 28(4)
[Dep. Wildl. Fish., Miss. State Univ., Mississippi State 39762]

83-002648 Brusca, R. C. and M. R. Gilligan. TONGUE REPLACEMENT IN A MARINE FISH (*LUTJANUS GUTTATUS*) BY A PARASITIC ISOPOD (CRUSTACEA: ISOPODA). *Copeia* 1983(3):813-816. 1983. SFA 28(4)
[Allan Hancock Found., Univ. South Calif., Los Angeles 90007]

83-002649 Deardorff, T. L. and F. G. Stanton. NEMATODE-INDUCED ABDOMINAL DISTENTION IN THE HAWAIIAN PUFFER FISH, *CANTHIGASTER JACTATOR* (JENKINS). *Pac. Sci.* 37(1):45-47. Jan. 1983. SFA 28(4)
[Dep. Trop. Med. Med. Microbiol., Honolulu, HI 96816]

83-002650 Dillon, W. A.; W. J. Hargis, Jr. and A. E. Harrises. [MONOGENETIC TREMATODES FROM SOUTH PACIFIC. POLYPISTHOCOTYLEIDS FROM AUSTRALIAN FISHES. SUBFAMILIES POLYLABRINAE AND MICROCOTYLINAE.] *Zool. Zh.* 62(6):821-830. June 1983. In Russian with English summ. SFA 28(4)
[Biol. Dep., Univ. Tenn., Martin]

83-002651 Gleason, L. N.; B. M. Christensen and Y. T. Chung. ARCHINEPHRIC DUCT LESIONS CAUSED BY *PHYLLODISTOMUM SUPERBUM* AND *P. LYSTERI* (DIGENEA: GORGODERIDAE) IN CATOSTOMID FISHES. *J. Wildl. Dis.*

OTHER DISEASES AND PARASITES (CONTINUED)

83-002651 CONTINUED 19(3):277-279. July 1983. SFA 28(4)
[Dep. Biol., West. Ky. Univ., Bowling Green 42101]

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POLLUTION

83-002661 Bellrose, F. C.; S. P. Havera; F. L. Paveglio, Jr. and D. W. Steffeck. THE FATE OF LAKES IN THE ILLINOIS RIVER VALLEY. *Ill. Nat. Hist. Surv. Biol. Notes* No. 119. 27p. Apr. 1983. SFA 28(4)
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[NMFS, P.O. Box 12607, Charleston, SC 29412-0607] Black sea bass, *Centropristis striata*, were daily force-fed capsules containing oyster, *Crassostrea virginica*, tissues previously exposed to ^{109}Cd in the presence and absence of ^{14}C-naphthalene (NPH). Black sea bass were sacrificed at 24, 72, and 336 hr, and values for radioactivity associated with Cd and total NPH compounds (including NPH cellular metabolites) determined for various tissues and body fluids. Results indicated that concentrations of tissue Cd were significantly higher when both Cd and NPH were ingested simultaneously. Tissue concentrations of total NPH compounds were generally not affected by the presence of Cd.

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[Res. Lab., Natl. Swed. Environ. Prot. Board, S-170 11 Drottningholm, Sweden] The fish in many Swedish lakes have been declared unfit for human consumption because they contain mercury levels of more than 1 mg/kg. Some of these lakes have not been exposed to direct mercury contamination, and mercury levels in the bottom sediments are therefore not elevated. The effect of intensive fishing on the mercury level in fish in such a lake has been studied. The mercury levels in the studied fish species were reduced by about 50 percent in the year after the intensive fishing, and were found to stay low for the remaining four years of the study. The results indicate that intensive fishing in a lake may lead to a considerable reduction in mercury

POLLUTION (CONTINUED)

83-002665 CONTINUED levels in the remaining fish. The reasons for this effect are not clear but are probably connected with a change in the biological flow of mercury, since the fishing caused very little reduction of the total content of mercury in the lake. The amount of mercury removed with the fish was calculated to be about one percent of the total amount of mercury in the upper three cm of the bottom sediment.

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[Appl. Phys. Lab. Aquatic Ecol. Sect., Johns Hopkins Univ., Shady Side, MD 20764] Picric acid (2,4,6-trinitrophenol) and picramic acid 2-amino-4,6-dinitrophenol) are potential water pollutents due to a variety of industrial and munition uses. The possible impacts of picric and picramic acid to two recreationally and commercially important species, rainbow trout, *Salmo gairdneri*, and American oysters, *Crassostrea virginica*, were evaluated. Picramic acid was more toxic than picric acid to both species tested. The 96-h LC50s for picric and picramic acids for rainbow trout were 109.6 and 46.2 mg/l, respectively. The 144-h LC50s for picric and picramic acid for American oysters were 254.9 and 69.8 mg/l, respectively. Sublethal no growth EC50s and shell deposition EC50s for oysters showed that both compounds caused adverse effects at much lower concentrations than indicated by the LC50s. For example, the 144-h shell deposition EC50s were 27.9 mg/l for picric acid and 5.6 mg/l for picramic acid. Sediment adsorbtion studies in estuarine water indicated that both coumpounds are not readily absorbed which suggests that sediment would not play a major role as a sink in contaminated systems. Oysters, which filter large quantities of particulate matter, would more likely be affected by picric and picarmic acids in the water column than by exposure to contaminated sediment.

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[NMFS, Milford Lab, Milford, CT 06460]

83-002669 Hodson, P. V.; B. R. Blunt; U. Borgmann; C. K. Minns and S. McGaw. EFFECT OF FLUCTUATING LEAD EXPOSURES ON LEAD ACCUMULATION BY RAINBOW TROUT (*SALMO GAIRDNERI*). *Environ. Toxicol. Chem.* 2(2):225-238. 1983. SFA 28(4)
[Great Lakes Fish. Res. Br., Canada Cent. Inland Waters, Burlington, ON L7R 4A6, Canada]

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83-002673 Persson, P. E.; M. Yurkowski and E. Marshall, (eds.). TASTE AND ODOUR IN WATERS AND AQUATIC ORGANISMS. *Water Sci. Technol.* 15(6-7):x + 333p. 1983. SFA 28(4)
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83-002674 Petukhov, S. A.; A. I. Glubokov and I. N. Gorkin. THE ROLE OF METALLOTHIONEIN IN CONCENTRATING HEAVY METALS IN FISH. *Ecological Aspects of Chemical and Radioactive Pollution of Aquatic Environment. VNIRO, Moscow, USSR.* 36-41. 1983. In Russian with English summ. SFA 28(4)

The experiments on the impact of high concentrations (up to several hundred μ g/l in water and several hundred mg/kg in food rations) of cadmium, copper, zinc and many other heavy metals on *Tilapia* kept in the aquarium have shown that the specific response of fish to pollutants is the synthesis of low-molecular proteins (metallothioneins) which bind the excessive quantity of heavy metals in the fish body taking them out from the metabolic processes. Metallothionein is mainly located in internal organs of the fish body, particularly in liver. The principal mode of heavy metal detoxication in muscles of fish is their binding with newly-synthesized metallothionein while the use of free SH-radicals of the available specific protein is characteristic for internal organs. The way of introduction of a toxicant governs the response of the fish body to the action of heavy metals. The synthetic intensity of metallothionein is higher when heavy metals are absorbed with food rather than they are absorbed from water. The mechanism of detoxication seems to be completely formed at the onset of sexual maturity of *Tilapia* or a little later.

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[Inst. Environ. Stud., Univ. Toronto, Toronto, ON M5S 1A4, Canada]

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FISH KILLS

83-002685 Sain, P. DECOMPOSITION OF WILD RICE (*ZIZANIA AQUATICA* L.) STRAW AND ITS EFFECT ON THE DEPLETION OF OXYGEN DURING WINTER IN NATURAL LAKES OF NORTHWESTERN ONTARIO. *Ontario Fish Tech. Rep. Ser.* No. 8. i + 4p. 1983. SFA 28(4)
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[K. S. Prasada Rao: Dep. Neurol., Univ. Miss. Med. Cent., 2500 North State St., Jackson 39216]

83-002688 Dauble, D. D.; S. A. Barraclough; R. M. Bean and W. E. Fallon. CHRONIC EFFECTS OF COAL-LIQUID DISPERSIONS ON FATHEAD MINNOWS AND RAINBOW TROUT. *Trans. Am. Fish. Soc.* 112(5):712-719. Sept. 1983. SFA 28(4)
[Environ. Sci. Dep., Pac. Northwest Lab., Richland, WA 99352]

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[Dep. Biol. Sci., The University, Dundee DD1 4HN, U.K.] African catfish, *Clarias mossambicus* showed no ill effects when kept in acid water pH 4-5 for 3-4 days. Their ionic regulatory response was examined and during 24 h exposure to water of pH 4, Na^+ efflux increased significantly but was not matched by an increase in Na^+ influx resulting in a substantial net loss of body Na^+, which was reduced from 65.4 mmol·kg^{-1} to 35.6 mmol·kg^{-1}, with smaller losses of Cl^- and K^+.

83-002690 Eddy, F. B.; P. A. Kunzlik and R. N. Bath. UPTAKE AND LOSS OF NITRITE FROM THE BLOOD OF RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON, AND ATLANTIC SALMON, *SALMO SALAR* L. IN FRESH WATER AND IN DILUTE SEA WATER. *J. Fish Biol.* 23(1):105-116. July 1983. SFA 28(4)
[Dep. Biol. Sci., The University, Dundee DD1 4HN, U.K.]

83-002691 Gillet, C. and P. Roubaud. INFLUENCE SUR LA SURVIE JUSQU'A ECLOSION DES EMBRYONS DE CARPE COMMUNE (*CYPRINUS CARPIO* L.) APRES TRAITEMENT, PENDANT LA FECONDATION ET LE DEVELOPPEMENT PRECOCE, PAR LE CARBENDAZIME, UN FONGICIDE ANTIMITOTIQUE DE SYNTHESE. [PREHATCHING SURVIVAL OF CARP EGGS AFTER TREATMENT DURING FERTILIZATION AND EARLY DEVELOPMENT WITH THE ANTIMITOTIC FUNGICIDE CARBENDAZIM.] *Water Res.* 17(10):1343-1348. 1983. In French with English summ. SFA 28(4)
[I.N.R.A., Lab. Physiol. Poissons, 78350 Jouy-en-Josas, France] The toxicity of the systemic antimitotic fungicide carbendazim, a benzimidazol compound, was studied both by trout and common carp insemination, as well as on the early development of the common carp. The toxicity is several grades of magnitude higher for these stages of the vital cycle compared with the effect on the adult stages: whereas *The Pesticide Manual* states that for the adult carp, an LC_{100} (24 h) ¶ 1000 mg l^{-1} we find, during insemination at pH 9: LC_{100} (30 min) < 5 mg l^{-1} and during insemination at pH 7: LC_{100} (30 min) <.5 mg l^{-1}. During early development we find, for instance, LC_{100} (30 min) < 5 mg l^{-1} before the end of activation and LC_{100} (24 H) < 1 mg l^{-1} before the end of epiboly. In the course of insemination, the egg is more sensitive to carbendazim at pH 7 than at pH 9: this difference may be attributed to a greater solubility of the non ionic form of the molecule in the biological membranes. The resistance of the embryo to short treatment grows at the end of activation. This may be attributed to the decrease of the shell permeability during activation. Before the end of activation, the resistance to short intoxication seems to be able to fluctuate, which perhaps corresponds to the existence of sensitive stages in the mitotic cycle. The resistance to an over 24-h exposure increases abruptly at the end

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83-002691 CONTINUED of epiboly, which could correspond to a protective part played by the enveloping layer. We suggest the possibility of classifying aquatic pollutants by correlating their physiological mode of action to the resistance profile of the fish embryo. The carp egg seems to be a favourable biological model for studying the effects of aquatic pollutants.

83-002692 Gupta, P. K. ACUTE TOXICITY OF PENTACHLOROPHENOL TO A FRESHWATER TELEOST, *RASBORA DANICONIUS NEILGERIENSIS* (HAMILTON). *Arch. Hydrobiol.* 98(1):127-132. 1983. SFA 28(4)
[Dep. Zool., KLDAV Coll., Roorkee 247667, India] The present paper deals with the toxicity of pentachlorophenol (PCP) to a freshwater teleost *Rasbora daniconius neilgeriensis* (Ham.). Static bioassay procedure was adopted for the evaluation of the toxicity of the chemical. The lethal concentrations (LC_{16}, LC_{50} and 95% fiducial limits and LC_{84}), slope functions, regression equations, heterogeneity factors, median survival periods, and analysis of variance were worked out for 12, 24, 48, 72 and 96 hr exposures. The 96 hr LC_{50} and 95% fiducial limits were in µg/l of PCP, 148.30 (135.80-161.80). The median survival periods exhibited increasing trend with decreasing concentrations.

83-002693 Gupta, S.; R. C. Dalela and P. K. Saxena. EFFECT OF PHENOLIC COMPOUNDS ON *IN VIVO* ACTIVITY OF TRANSAMINASES IN CERTAIN TISSUES OF THE FISH, *NOTOPTERUS NOTOPTERUS*. *Environ. Res.* 32(1):8-13. Oct. 1983. SFA 28(4)
[P.K. Saxena: Dep. Zool., Fac. Basic Sci., Punjab Agric. Univ., Ludhiana-141004, India]

83-002694 Hansen, D. J.; L. R. Goodman; J. C. Moore and P. K. Higdon. EFFECTS OF THE SYNTHETIC PYRETHROIDS AC 222,705, PERMETHRIN AND FENVALERATE ON SHEEPSHEAD MINNOWS IN EARLY LIFE STAGE TOXICITY TESTS. *Environ. Toxicol. Chem.* 2(2):251-258. 1983. SFA 28(4)
[U.S. EPA, Gulf Breeze Environ. Res. Lab., Gulf Breeze, FL 32561] Sheepshead minnows (*Cyprinodon variegatus*) were exposed to the synthetic pyrethroid insecticides AC 222,705, permethrin or fenvalerate for 28 d in early life stage toxicity tests. AC 222,705 was 370 times more toxic than permethrin and 30 times more toxic than fenvalerate, with survival and size of fish being the most sensitive measures of effect. AC 222,705 significantly reduced survival of hatched fish at 0.61 µg/L and their average weight at 0.06 µg/L; no effects were detected at 0.03 µg/L. Two of the AC 222,705 concentrations that diminished weights, 0.06 and 0.12 µg/L, were below our limit of chemical detection (0.15 µg/L). Permethrin reduced survival of hatched fish at 22 µg/L; no effects were detected at 10 µg/L. Fenvalerate significantly reduced survival of hatched fish at 3.9 µg/L and both weight and length at 2.2 µg/L; no effects were detected at 0.56 µg/L. The 96-h LC_{50} divided by the no-effect concentration was 0.8 for permethrin, 9 for fenvalerate and 37 for AC 222,705. The mean bioconcentration factors determined from concentrations measured in whole fish divided by average concentrations measured in exposure water were 480 for permethrin and 570 for fenvalerate; AC 222,705 was not detected in fish that survived the exposure.

83-002695 Hulsman, P. F.; P. M. Powles and J. M. Gunn. MORTALITY OF WALLEYE EGGS AND RAINBOW TROUT YOLK-SAC LARVAE IN LOW-PH WATERS OF THE LACLOCHE MOUNTAIN AREA, ONTARIO. *Trans. Am. Fish. Soc.* 112(5):680-688.

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83-002695 CONTINUED Sept. 1983. SFA 28(4)
[Haliburton-Hastings Fish. Assess. Unit, Minist. Nat. Resour., Box 500, Bancroft, ON K0L 1C0, Canada]

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[Dep. Fish., Fac. Agric., Kyushu Univ. 46-04, Hakozaki, Higashi-ku, Fukuoka 812, Japan]

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83-002698 Jagoe, C. H. and T. A. Haines. ALTERATIONS IN GILL EPITHELIAL MORPHOLOGY OF YEARLING SUNAPEE TROUT EXPOSED TO ACUTE ACID STRESS. *Trans. Am. Fish. Soc.* 112(5):689-695. Sept. 1983. SFA 28(4)
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83-002699 Khan, R. A. and J. Kiceniuk. EFFECTS OF CRUDE OILS ON THE GASTROINTESTINAL PARASITES OF TWO SPECIES OF MARINE FISH. *J. Wildl. Dis.* 19(3):253-258. July 1983. SFA 28(4)
[Dep. Biol., Memorial Univ. Newfoundland, St. John's, NF A1C 5S1, Canada]

83-002700 Klein, S. A. and D. Jenkins. THE TOXICITY OF JET FUELS TO FISH--II. THE TOXICITY OF JP-8 TO FLAGFISH (*JORDANELLA FLORIDAE*) AND RAINBOW TROUT (*SALMO GAIRDNERI*) AND GOLDEN SHINERS (*NOTEMIGONUS CHRYSOLEUCAS*). *Water Res.* 17(10):1213-1220. 1983. SFA 28(4)
[Sanitary Eng. Lab., Univ. Calif., Berkeley 94720] JP-8 is a widely-used commercial and military jet fuel which may reach the aquatic environment by several avenues. The toxicity of JP-8 to cold and warm water fish was investigated to help define the impact on fresh water species. Fish were exposed to the water soluble fraction (WSF) of JP-8 in static acute bioassays and continuous-flow bioassays of approx. 4 months duration. The goal was to determine the 96-h LC_{50} and the long-term no effect level on the life cycle. The acute toxicity to a warm water fish was found to be unaffected by pH in the range of 7.3-9.1. The no effect level with respect to growth was lower in rainbow trout than in flagfish. Fuel accumulation and depuration from fish tissues are compared for the two species, as are the effects on egg hatching. The relative toxicity of JP-8 and JP-9 (previously reported) is discussed.

83-002701 Limsuwan, C.; J. M. Grizzle and J. A. Plumb. ETOMIDATE AS AN ANESTHETIC FOR FISH: ITS TOXICITY AND EFFICACY. *Trans. Am. Fish. Soc.* 112(4):544-550. July 1983. SFA 28(4)
[Dep. Fish. Allied Aquacult., Ala. Agric. Exp. Stn., Auburn Univ., AL 36849]

TOXICOLOGY; BIOASSAYS (CONTINUED)

83-002702 Marcelle, C. and J. P. Thome. ACUTE TOXICITY AND BIOACCUMULATION OF LINDANE IN GUDGEON, *GOBIO GOBIO* (L.). *Bull. Environ. Contam. Toxicol.* 31(4):453-458. Oct. 1983. SFA 28(4)
[Rue du Mont, 24, B-4458 Fexhe-Slins, Belgium]

83-002703 Naqvi, S. M. and T. Leung. TRIFLURALIN AND ORYZALIN HERBICIDES TOXICITIES TO JUVENILE CRAWFISH (*PROCAMBARUS CLARKII*) AND MOSQUITOFISH (*GAMBUSIA AFFINIS*). *Bull. Environ. Contamin. Toxicol.* 31(3):304-308. Sept. 1983. SFA 28(4)
[Dep. Biol. Sci., Southern Univ., Baton Rouge, LA 70813]

83-002704 Oikari, A.; B. Lönn; M. Castrén; T. Nakari; B. Snickars-Nikinmaa; H. Bister and E. Virtanen. TOXICOLOGICAL EFFECTS OF DEHYDROABIETIC ACID (DHAA) ON THE TROUT, *SALMO GAIRDNERI* RICHARDSON, IN FRESH WATER. *Water Res.* 17(1):81-89. 1983. SFA 28(4)
[Div. Physiol., Dep. Zool., Univ. Helsinki, Arkadiankatu 7, SF-00100 Helsinki 10, Finland]

83-002705 Primor, N. PARDAXIN PRODUCES SODIUM INFLUX IN THE TELEOST GILL-LIKE OPERCULAR EPITHELIA. *J. Exp. Biol.* 105:83-94. July 1983. SFA 28(4)
[Osborn Lab. Mar. Sci., N.Y. Aquarium, N.Y. Zool. Soc., Brooklyn 11224]

83-002706 Rombough, P. J. EFFECTS OF LOW pH ON EYED EMBRYOS AND ALEVINS OF PACIFIC SALMON. *Can. J. Fish. Aquatic Sci.* 40(10):1575-1582. Oct. 1983. In English with French summ. SFA 28(4)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

83-002707 Sadler, K. A MODEL RELATING TO THE RESULTS OF LOW pH BIOASSAY EXPERIMENTS TO A FISHERY STATUS OF NORWEGIAN LAKES. *Freshwater Biol.* 13(5):453-463. Oct. 1983. SFA 28(4)
[Cent. Elec. Res. Lab., Freshwater Biol. Unit, Ratcliffe-on-Soar Power Stn., Nottingham, England] Data from the literature concerning several Norwegian brown trout (*Salmo trutta*) populations are used to construct Leslie matrices in order to estimate their capacity to withstand egg and fry mortalities. These estimates are compared with the results of bioassay studies conducted at pH 4.5 and at various calcium concentrations in order to predict the percentage of trout populations which would be able to survive these conditions. These predictions are in good agreement with the observed fishery status of Norwegian lakes at calcium concentrations <30μeq 1^{-1} but above this concentration the recorded status is worse than predicted. Likely causes from this difference are considered to be effects acting on fish older than those used in the bioassay experiments (either mortality or reduction in fecundity possibly due to impaired growth) or the effects of other water quality factors, for example aluminum. These effects need only be fairly slow acting as compared with the egg and fry mortalities so far studied in detail. Thus the discrepancy between predicted and observed results at pH 4.5 and 50 μeq 1^{-1} calcium could be caused by an additional 80% mortality acting over the 4-8 year period before maturation. An additional factor which could result in the observed fishery status being worse than predicted is temporal variation in water chemistry which is not assessed in the survey of Norwegian lakes. In particular, the adverse conditions occurring at time of snowmelt could be critically important.

TOXICOLOGY; BIOASSAYS (CONTINUED)

83-002708 Sanders, H. O.; M. T. Finley and J. B. Hunn. ACUTE TOXICITY OF SIX FOREST INSECTICIDES TO THREE AQUATIC INVERTEBRATES AND FOUR FISHES. *U.S. Fish Wildl. Serv. Tech. Pap.* 110. 5p. 1983. SFA 28(4)
[U.S. FWS, Columbia Natl. Fish. Res. Lab., Rt. 1, Columbia, MO 65201] Technical grade and field formulations of six experimental forest insecticides - methomyl, carbaryl, aminocarb, trichlorfon, fenitrothion, and acephate - were tested for acute toxicity against three species of aquatic invertebrates (a daphnid, *Daphnia magna*; an amphipod, *Gammarus pseudolimnaeus*; and larvae of a midge, *Chironomus plumosus*), and four species of fish (bluegill, *Lepomis macrochirus*; rainbow trout, *Salmo gairdneri*; fathead minnow, *Pimephales promelas*; and channel catfish, *Ictalurus punctatus*). Five of the six insecticides tested were highly toxic (EC50, 100-1,000μg/L) or extremely toxic (EC50,≤100μg/L) to the daphnid, amphipod, and midge larvae; the 48-h EC50's ranged from 320 to 0.10μg/L for daphnids and midge larvae, and the 96-h LC50 from 2 to 920μg/L for the amphipod. The sixth insecticide, acephate, was not toxic to invertebrates at concentrations up to 50 mg/L. Five of the insecticides ranged from highly toxic (methomyl, to channel catfish) to relatively non-toxic (trichlorfon, to fathead minnows); the sixth, acephate, was only slightly toxic to the fishes tested. In tests with bluegills and rainbow trout, the toxicity of methomyl and fenitrothion was little influenced by temperature, pH, or water hardness but that of carbaryl, aminocarb, and trichlorfon generally increased with increasing temperature or pH, or both.

83-002709 Sastry, K. V. and K. Subhadra. CADMIUM INDUCED ALTERATIONS IN THE INTESTINAL ABSORPTION OF GLUCOSE AND FRUCTOSE IN A FRESHWATER CAT FISH, *HETEROPNEUSTES FOSSILIS*. *Water Air Soil Pollut.* 20(3):293-297. Oct. 1983. SFA 28(4)
[Environ. Toxicol. Lab., Dep. Zool., D.A.V. (P.G.) Coll., Muzaffarnagar, 251001, India] The effect of four concentrations (1.0, 0.1, 0.01, and 0.001 mM) of Cd on the rate of absorption of two sugars, glucose and fructose by the intestine of the fresh water cat fish, *Heteropneustes fossilis* has been studied after 1 h at 23°C. Intestinal glucose and fructose transport was also assessed in fish exposed to a sublethal concentration (0.0023 mM) of Cd in the ambient water for 15 and 30 days. Control fish showed no marked difference in the rates of absorption of glucose and fructose. All four concentrations of Cd decreased the rate of transport of glucose and fructose significantly. Among the two sugars, decrease in the rate of transport of fructose was more marked than glucose. In fish exposed to Cd in the ambient water, reduction of glucose and fructose absorption was greater after 30 days of exposure than after 15 days.

83-002710 Shea, T. B. and E. S. Berry. TOXICITY OF CARBARYL AND 1-NAPHTHOL TO GOLDFISH (*CARASSIUS AURATUS*) AND KILLIFISH (*FUNDULUS HETEROCLITUS*). *Bull. Environ. Contam. Toxicol.* 31(5):526-529. Nov. 1983. SFA 28(4)
[Dep. Biol., Northeastern Univ., Boston, MA 02115]

83-002711 Shirokova, E. N. [THE ACCUMULATION RATE OF CADMIUM IN SOME SPECIES OF FISH DURING EARLY ONTOGENESIS.] *Physiological Basis of Reproduction of Marine and Anadromous Fish. VNIRO, Moscow, USSR.* p. 93-101. 1983. In Russian with English summ. SFA 28(4)

83-002712 Sippel, A. J. A.; J. R. Geraci and P. V. Hodson. HISTOPATHOLOGICAL AND PHYSIOLOGICAL RESPONSES OF RAINBOW TROUT (*SALMO GAIRDNERI* RICHARDSON) TO SUBLETHAL LEVELS OF LEAD. *Water Res.*

TOXICOLOGY; BIOASSAYS (CONTINUED)

83-002712 CONTINUED 17(9):1115-1118. 1983. SFA 28(4)
[Fish Cult. Sect., Fish. Br., Ontario Minist. Nat. Resour., Queen's Park, Toronto, ON M7A 1W4, Canada] Rainbow trout (*Salmo gairderi*) were exposed to sublethal levels of water-borne or dietary lead for 32 weeks. The study included a histopathological assessment of all organs, examination of red cell morphology, and a comparison of oxygen consumption in liver homogenates from exposed and control fish. No effects of lead toxicity were noted in these parameters. The most sensitive and reliable indicator of lead toxicity was the development of black tails and spinal curvature. These changes were observed in 30% of trout exposed to 120 ±31 μg Pb l^{-1} of water-borne lead after 30 weeks. No other effects of lead toxicity were noted.

83-002713 Soivio, A.; S. Lindgren and A. Oikari. SEASONAL CHANGES IN CERTAIN METABOLIC AND HAEMATOLOGIC RESPONSES OF *SALMO GAIRDNERI* ACUTELY EXPOSED TO DEHYDROABIETIC ACID (DHAA). *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 75(2):281-284. 1983. SFA 28(4)
[Dep. Zool., Univ. Helsinki, Arkadiankatu 7, SF-00100 Helsinki 10, Finland]

83-002714 Storozhuk, N. G. and M. N. Chistova. [THE STATE OF GONADS IN JUVENILES OF PINK SALMON UNDER THE INFLUENCE OF MERCURY.] *Physiological Basis of Reproduction of Marine and Anadromous Fish. VNIRO, Moscow, USSR.* p. 85-90. 1983. In Russian with English summ. SFA 28(4)
It is ascertained that mercury makes no impact on the morphological state of gonads of pink salmon. In males and females kept in the solution of the toxicant for 3.5 months the development of gonads was not retarded, neither mortality or destruction of sexual cells was found. Although there was no statistically valid difference due to a great variability of characteristics a clear trend can be observed indicating that the spermaries of males from the experimental lot are bigger than those of the control.

83-002715 Stott, G. G.; W. E. Haensly; J. M. Neff and J. R. Sharp. HISTOPATHOLOGIC SURVEY OF OVARIES OF PLAICE, *PLEURONECTES PLATESSA* L., FROM ABER WRAC'H AND ABER BENOIT, BRITTANY, FRANCE: LONG-TERM EFFECTS OF THE *AMOCO CADIZ* CRUDE OIL SPILL. *J. Fish Dis.* 6(5):429-437. Sept. 1983. SFA 28(4)
[W. E. Haensly: Dep. Vet. Anat., Coll. Vet. Med., Tex. A & M Univ., College Station 77843]

83-002716 Suloway, J. J.; W. R. Roy; T. M. Skelly; D. R. Dickerson; R. M. Schuller and R. A. Griffin. CHEMICAL AND TOXICOLOGICAL PROPERTIES OF COAL FLY ASH. *Ill. State Nat. Hist. Surv. Div. Environ. Geol. Notes* 105. 70p. 1983. SFA 28(4)
[Ill. Nat. Hist. Surv., 607 East Peabody Dr., Champaign 61820]

83-002717 Swigert, J. P. and A. Spacie. SURVIVAL AND GROWTH OF WARMWATER FISHES EXPOSED TO AMMONIA UNDER LOW FLOW CONDITIONS. *Purdue Univ. Water Resour. Cent. Tech. Rep.* 157. x + 83p. June 1983. SFA 28(4)
[Water Resour. Res. Cent., Purdue Univ., West Lafayette, IN 47907]

83-002718 Takle, J. C. C.; T. L. Beitinger and K. L. Dickson. EFFECT OF THE AQUATIC HERBICIDE ENDOTHAL ON THE CRITICAL THERMAL MAXIMUM OF RED SHINER, *NOTROPIS LUTRENSIS*. *Bull. Environ. Contam. Toxicol.* 31(5):512-517. Nov.

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83-002718 CONTINUED 1983. SFA 28(4)
[Inst. Appl. Sci., North Tex. State Univ., Denton 76203]

83-002719 Thébault, M. T. and F. X. Decaris. Ca^{2+} ATPASE INHIBITION IN TROUT GILL MICROSOMES FOLLOWING *IN VITRO* AND *IN VIVO* TREATMENTS WITH 2,4,5.T. *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 75(2):369-372. 1983. SFA 28(4)
[Lab. Mar. Biol., Coll. France, B.P. 38,29 182, Concarneau, France]

83-002720 Thurston, R. V. and R. C. Russo. ACUTE TOXICITY OF AMMONIA TO RAINBOW TROUT. *Trans. Am. Fish. Soc.* 112(5):696-704. Sept. 1983. SFA 28(4)
[Fish. Bioassay Lab., Mont. State Univ., Bozeman 59717]

83-002721 Thurston, R. V.; R. C. Russo and G. R. Phillips. ACUTE TOXICITY OF AMMONIA TO FATHEAD MINNOWS. *Trans. Am. Fish. Soc.* 112(5):705-711. Sept. 1983. SFA 28(4)
[Fish. Bioassay Lab., Mont. State Univ., Bozeman 59717]

83-002722 Tikhonova, L. S. [THE INFLUENCE OF THE CARBAMATE AGENT «SATURN» ON VARIOUS FUNCTIONAL SYSTEMS OF STURGEON FROM THE DON RIVER.] *Physiological Basis of Reproduction of Marine and Anadromous Fish. VNIRO, Moscow, USSR.* p. 90-93. 1983. In Russian with English summ. SFA 28(4)

The influence of various concentrations of the carbamate agent «Saturn» on the condition of juveniles of sturgeon from the Don River was examined by the method of morphophysiological indicators. A certain correlation is revealed between the complex of symptoms found in poisoned juveniles and the state of their cardiovascular, respiratory and immunologic systems. It is ascertained that the threshold concentration of the agent is equal to 0.05 mg/l and the safe concentration is 0.005 mg/l. It is the respiratory system of juveniles that is mostly affected by the agent.

83-002723 Toor, H. S.; H. S. Sehgal and C. S. Brar. WATER-SOLUBLE PHOSPHATES: OBSERVED EFFECTS ON EMBRYONIC DEVELOPMENT, HATCHING TIME, AND SURVIVAL OF COMMON CARP. *Prog. Fish-Cult.* 45(2):134-135. Apr. 1983. SFA 28(4)
[Fish. Res. Complex, Dep. Zool., Punjab Agric. Univ., Ludhiana - 141004 India]

83-002724 Tucker, C. S. and T. E. Schwedler. VARIABILITY OF PERCENT METHEMOGLOBIN IN POND POPULATIONS OF NITRITE-EXPOSED CHANNEL CATFISH. *Prog. Fish-Cult.* 45(2):108-110. Apr. 1983. SFA 28(4)
[Miss. Agric. For. Exp. Stn., Stoneville 38776]

83-002725 Veith, G. D.; D. J. Call and L. T. Brooke. STRUCTURE-TOXICITY RELATIONSHIPS FOR THE FATHEAD MINNOW, *PIMEPHALES PROMELAS*: NARCOTIC INDUSTRIAL CHEMICALS. *Can. J. Fish. Aquatic Sci.* 40(6):743-748. June 1983. In English with French summ. SFA 28(4)
[U.S. EPA, 6201 Congdon Blvd., Duluth, MN 55804]

TOXICOLOGY; BIOASSAYS (CONTINUED)

83-002726 Verma, S. R. and I. P. Tonk. EFFECT OF SUBLETHAL CONCENTRATIONS OF MERCURY ON THE COMPOSITION OF LIVER, MUSCLES AND OVARY OF *NOTOPTERUS NOTOPTERUS*. *Water Air Soil Pollut.* 20(3):287-292. Oct. 1983. SFA 28(4)

[Pollut. Relevant Res. Lab., P.O. Box 264, Dep. Zool., D.A.V. Coll. Muzaffarnagar, 251001, India] The present investigation was undertaken to evaluate the effect of sublethal concentrations (0.088 and 0.044 mg l^{-1}, i.e., 1/5th and 1/10th fraction of 96 h LC_{50}) of mercuric chloride on Ca, inorganic phosphate, water content, ash, glycogen, Fe, total protein, lipid contents and vitamin A, C, D, and E of liver, muscles and ovary of the freshwater fish *Notopterus notopterus* exposed for 30 days. The results obtained indicate that Ca, inorganic phosphate, water, ash, glycogen, Fe, total protein contents and vitamin D decreased significantly or insignificantly in these tissues of the Hg exposed fishes. However, lipid content increased in liver and muscles, but decreased in the ovaries. Vitamin A and D increased in the liver but decreased in the muscles and ovaries. Moreover, vitamin E increased in all the tissues of the fish exposed to 0.088 l^{-1} of Hg concentrations.

83-002727 Weis, P. and J. S. Weis. EFFECTS OF EMBRYONIC PRE-EXPOSURE TO METHYLMERCURY AND Hg^{2+} ON LARVAL TOLERANCE IN *FUNDULUS HETEROCLITUS*. *Bull. Environ. Contam. Toxicol.* 31(5):530-534. Nov. 1983. SFA 28(4)

[Dep. Anat., Univ. Med. Dent. N. J., Newark 07103]

83-002728 Wilde, E. W.; R. J. Soracco; L. A. Mayack; R. L. Shealy; T. L. Broadwell and R. F. Steffen. COMPARISON OF CHLORINE AND CHLORINE DIOXIDE TOXICITY TO FATHEAD MINNOWS AND BLUEGILL. *Water Res.* 17(10):1327-1331. 1983. SFA 28(4)

[Savannah River Lab., E. I. du Pont de Nemours & Co., Aiken, SC 29808] The comparative toxicity of total residual chlorine (TRC) and chlorine dioxide (ClO_2) was evaluated by conducting 96 h flow-through bioassays with three types of fish. The fish were subjected to an intermittent exposure regime in which biocide residuals were present for approx. 2-h periods beginning at 0, 24, 48 and 72 h into the tests. These conditions simulated the antifouling procedure (1 h day^{-1} biocide addition) used to control biofouling of nuclear reactor heat exchangers at the Savannah River Plant near Aiken, South Carolina. LC_{50} values showed that ClO_2 was approx. 2-4 times more toxic than TRC to: (1) juvenile and 1-year-old fathead minnows (*Pimephales promelas*); and (2) young-of-the-year bluegill (*Lepomis macrochirus*). The TRC mean 96-h LC_{50} values were: 0.08 mg l^{-1} for adult fathead minnows, 0.35 mg l^{-1} for adult fathead minnows, and 0.44 mg l^{-1} for young-of-the-year bluegills. The ClO_2 mean LC_{50} values were: 0.02 mg l^{-1} for juvenile fathead minnows, 0.17 mg l^{-1} for adult fathead minnows and 0.15 l^{-1} for young-of-the-year bluegills.

83-002729 Wilde, E. W.; R. J. Soracco; L. A. Mayack; R. L. Shealy and T. L. Broadwell. ACUTE TOXICITY OF CHLORINE AND BROMINE TO FATHEAD MINNOWS AND BLUEGILLS. *Bull. Environ. Contam. Toxicol.* 31(3):309-314. Sept. 1983. SFA 28(4)

[Savannah River Lab., E. I. du Pont de Nemours & Co., Aiken, SC 29808]

83-002730 Woodhead, A. D.; R. B. Setlow and V. Pond. THE EFFECTS OF CHRONIC EXPOSURE TO ASBESTOS FIBERS IN THE AMAZON MOLLY *POECILIA FORMOSA*. *Environ. Int.* 9(3):173-176. 1983. SFA 28(4)

[Biol. Dep., Brookhaven Natl. Lab., Upton, NY 11973] Amazon mollies were exposed for 6 months to several concentrations of coarse and fine asbestos particles suspended in their aquarium water. At the end of this period, the

TOXICOLOGY; BIOASSAYS (CONTINUED)

83-002730 CONTINUED fish were serially sectioned and the tissues examined for lesions. Pathological changes were found in the kidneys, the major site of accumulation of the mineral fibers after their entry into the body through the intestinal mucosa. There was no evidence of entry of particles through gill epithelium. Epithelial hypertrophy and secondary lamellar telangiectasia of the gills appeared to be the result of physical abrasion by the abestos particles. There was no cellular injury in the liver or the muscles.

83-002731 Zischke, J. A.; J. W. Arthur; K. J. Nordlie; R. O. Hermanutz; D. A. Standen and T. P. Henry. ACIDIFICATION EFFECTS ON MACROINVERTEBRATES AND FATHEAD MINNOWS (*PIMEPHALES PROMELAS*) IN OUTDOOR EXPERIMENTAL CHANNELS.] *Water Res.* 17(1):47-63. 1983. SFA 28(4)
[Dep. Biol., St. Olaf Coll., Northfield, MN 55057]

FISH TOXICANTS

83-002732 Dawson, V. K.; P. D. Harman; D. P. Schultz and J. L. Allen. RAPID METHOD FOR MEASURING ROTENONE IN WATER AT PISCICIDAL CONCENTRATIONS. *Trans. Am. Fish. Soc.* 112(5):725-727. Sept. 1983. SFA 28(4)
U.S. FWS, Natl. Fish. Res. Lab., P.O. Box 818, La Crosse, WI 54601]

RESEARCH AND MANAGEMENT-GENERAL

83-002733 Tubb, R. A. PREPARING UNDERGRADUATE STUDENTS FOR CAREERS IN FISHERIES AND WILDLIFE. *Fisheries (Bull. Am. Fish. Soc.)* 8(4):18-20. July-Aug. 1983. SFA 28(4)
[Dep. Fish. Wildl., Oreg. State Univ., Corvallis 97331]

83-002734 Van Loggerenberg, N. CONSERVATION OF TIGERFISH AND FISH FARMING TECHNIQUES. *Fauna Flora (Transvaal)* 40:30-31. 1983. SFA 28(4)

83-002735 Wilson, J. FIVE-YEAR PLAN PROVIDES A PEEK INTO THE FISHING FUTURE. *Ky. Happy Hunting Ground* 39(4):2-5,28. July-Aug. 1983. SFA 28(4)

REPORTS OF FISHERY STATIONS, STATES, ETC.

83-002736 Anonymous. PROGRESS REPORT OF THE FRESHWATER AQUACULTURE CENTER. *Freshwater Aquacult. Cent. Cent. Luzon State Univ. Tech. Rep.* No. 20. iii + 86p. 1983. SFA 28(4)
[Freshwater Aquacult. Cent., Cent. Luzon State Univ., Munoz, Nueva Ecija 2320 Philippines]

REPORTS OF FISHERY STATIONS, STATES, ETC. (CONTINUED)

83-002737 Great Lakes Fishery Commission. ANNUAL REPORT FOR 1980. *Great Lakes Fish. Comm. Annu. Rep.* 1980. 129p. 1983. SFA 28(4)
[1451 Green Rd., Ann Arbor, MI]

83-002738 Great Lakes Fishery Commission. ANNUAL REPORT FOR 1981. *Great Lakes Fish. Comm. Annu. Rep.* 1981. 131p. 1983. SFA 28(4)
[1451 Green Rd., Ann Arbor, MI]

83-002739 International Pacific Salmon Fisheries Commission. ANNUAL REPORT 1982. *Int. Pac. Salmon Fish. Comm. Annu. Rep.* 1982. 46p. 1983. SFA 28(4)
[New Westminster, BC, Canada]

HABITAT ALTERATIONS

83-002740 Ambrose, R. E.; C. R. Hinkle and C. R. Wenzel. PRACTICES FOR PROTECTING AND ENHANCING FISH AND WILDLIFE ON COAL SURFACE-MINED LAND IN CENTRAL AND SOUTHERN APPALACHIA. *U.S. Fish Wildl. Serv.* FWS/OBS-83/08. x + 208p. Mar. 1983. SFA 28(4)
[Science Applications, Inc., 800 Oak Ridge Turnpike, Oak Ridge, TN 37830]

83-002741 Ambrose, R. E.; C. R. Hinkle and C. R. Wenzel. PRACTICES FOR PROTECTING AND ENHANCING FISH AND WILDLIFE ON COAL SURFACE-MINED LAND IN THE SOUTHCENTRAL U.S. *U.S. Fish Wildl. Serv.* FWS/OBS-83/11. x + 229p. Mar. 1983. SFA 28(4)
[Science Applications, Inc., 800 Oak Ridge Turnpike, Oak Ridge, TN 37830]

83-002742 Bryant, M. D. THE ROLE AND MANAGEMENT OF WOODY DEBRIS IN WEST COAST SALMONID NURSERY STREAMS. *N. Am. J. Fish. Manage.* 3(3):322-330. 1983. SFA 28(4)
[USDA For. Serv., For. Sci. Lab., P.O. Box 909, Juneau, AK 99802]

83-002743 Hartzler, J. R. THE EFFECTS OF HALF-LOG COVERS ON ANGLER HARVEST AND STANDING CROP OF BROWN TROUT IN MCMICHAELS CREEK, PENNSYLVANIA. *N. Am. J. Fish. Manage.* 3(3):228-238. 1983. SFA 28(4)
[Pohoqualine Fish Assoc., R.D. 6, Box 6308, Stroudsburg, PA 18360]

83-002744 Malyarevskaya, A. Y. INFLUENCE OF ANTHROPOGENIC EUTROPHICATION: EFFECTS ON FISH IN THE FORM OF BLUE-GREEN ALGAE MASS DEVELOPMENT. *Arch. Hydrobiol.* 97(4):417-424. 1983. SFA 28(4)
[Inst. Hydrobiol., Ukranian Acad. Sci., Vladimirskaya 44, Kiev, 252003, USSR] The influence of eutrophication after-effects on fish in the form of blue-green algae depends on a complicated complex of biotic and abiotic factors. It is manifested in disturbance of plastic and energy metabolism ratio in fish in favour of the dominance of the latter, resulted from the disturbance of regulators of cellular metabolism in particular of nicotinamide coferments and coferment vitamins. On the basis of carried-out investigations the most sensitive to the blue-green algae effect links of metabolism in fish were found and a theory explaining the mechanism of this effect was suggested.

HABITAT ALTERATIONS (CONTINUED)

83-002745 Okamoto, M. [STUDIES ON THE BEHAVIORAL CHARACTER OF FISHES AROUND THE ARTIFICIAL SEAWEED FARM PLANT.] *Bull. Jpn. Soc. Sci. Fish.* 49(5):687-692. May 1983. In Japanese with English summ. SFA 28(4)
[Jpn. Mar. Sci. Technol. Cent., Natsushima, Yokosuka 237, Japan]

83-002746 Platts, W. S. and W. R. Meehan. LIVESTOCK GRAZING AND FISH ENVIRONMENTS: SITUATION AND NEEDS. Univ. Calif. Agric. Sci. Publ. Spec. Publ. 3301. p. 30-35. 1977. SFA 28(4)
[Intermountain For. Range Exp. Stn., 507 25th Street, Ogden, UT 84401]

83-002747 Platts, W. S.; R. J. Behnke; J. C. Buckhouse and others. LIVESTOCK INTERACTIONS WITH FISH AND THEIR ENVIRONMENTS. Univ. Calif. Agric. Sci. Publ. Spec. Publ. 3301. p. 36-41. 1977. SFA 28(4)
[Intermountain For. Range Exp. Stn., 507 25th Street, Ogden, UT 84401]

83-002748 Proctor, B. R.; R. W. Thompson; J. E. Bunin; K. W. Fucik; G. R. Tamm and E. G. Wolf. PRACTICES FOR PROTECTING AND ENHANCING FISH AND WILDLIFE ON COAL SURFACE-MINED LAND IN THE GREEN RIVER-HAMS FORK REGION. *U.S. Fish Wildl. Serv.* FWS/OBS-83/09. x+242p. Mar. 1983. SFA 28(4)
[Science Applications, Inc., 1726 Cole Blvd., Suite 350, Golden, CO 80401]

83-002749 Proctor, B. R.; R. W. Thompson; J. E. Bunin; K. W. Fucik; G. R. Tamm and E. G. Wolf. PRACTICES FOR PROTECTING AND ENHANCING FISH AND WILDLIFE ON COAL MINED LAND IN THE UINTA-SOUTHWESTERN UTAH REGION. *U.S. Fish Wildl. Serv. FWS/OBS-83/12. x + 250p. Mar. 1983. SFA 28(4)*
[Science Applications, Inc., 1726 Cole Blvd., Suite 350, Golden, CO 80401]

83-002750 Sarrazin, R.; M. Cantin; A. Gagnon; C. Gauthier and G. Lefebvre. LA PROTECTION DES HABITATS FAUNIQUES AU QUÉBEC. [THE PROTECTION OF WILDLIFE HABITATS IN QUEBEC.] *Quebec Dir. Gen. Faune* xvi+256p. Apr. 1983. In French. SFA 28(4)

83-002751 Sarrazin, R.; M. Cantin; A. Gagnon; C. Gauthier and G. Lefebvre. LA PROTECTION DES HABITATS FAUNIQUES AU QUÉBEC. LES ACTIVITÉS DES MILIEN ET LEURS RÉPERASSIONS SUR LA FAUNE. [THE PROTECTION OF WILDLIFE HABITATS IN QUEBEC. HABITAT ALTERATIONS IN THE ENVIRONMENT AND THEIR REPERCUSSIONS IN WILDLIFE.] *Quebec Dir. Gen. Faune* ix+175p. Apr. 1983. In French. SFA 28(4)

83-002752 Savelyeva, E. A.; V. I. Beresovskaya; J. I. Kovalenko and B. B. Ponomarev. [REPRODUCTION OF STURGEONS IN THE AZOV SEA - KUBAN RIVER AREA.] *Biological Productivity in the Azov and Caspian Seas. VNIRO, Moscow, USSR.* p. 45-53. 1982. In Russian with English summ. SFA 28(4)
The intensive construction of hydropower schemes in the Azov Sea - Kuban River area has led to a sharp reduction in the natural reproduction of sturgeons and has affected their artificial propagation. Due to the fact that an inadequate number of spawners enter the rivers the hatcheries have to collect them in the sea. Besides the mass run of anadromous spawners into the rivers proceeds in a shorter period of time and hatcheries have to collect more spawners than their operation capacities permit. So the Azov Sea spawners are under-used, the eggs are collected in inadequate quantities and some additional eggs to be delivered from the Caspian Sea. Since the commercial propagation of sturgeons is entirely dependent upon natural reproduction it is necessary that urgent measures should be taken to conserve

HABITAT ALTERATIONS (CONTINUED)

83-002752 CONTINUED the stock of the Azov Sea sturgeons, such as to secure an adequate drawdown of water for spawners entering the rivers so that they could migrate safely upstream to the spawning grounds, to design fish-protecting devices at water intakes, to construct supplementary farms for maintaining spawners and to arrange transportation of juveniles by air into adaptation lagoons. Under these conditions the efficiency of sturgeon culture may increase in the Azov Sea.

83-002753 Unkenholz, D. G. PADDLEFISH SPAWNING MOVEMENTS AND REPRODUCTIVE SUCCESS IN THE MISSOURI RIVER BELOW FORT RANDALL DAM, 1979-81. *S. Dak. Dep. Game Fish Parks Compl. Rep.* No. 82-3. iv + 17p. Feb. 1982. SFA 28(4)

Young-of-the-year (YOY) paddlefish were collected each year since 1965 from Lewis and Clark Lake. Catch per effort index ranged from a low of 0.20 in 1981 to a high of 6.79 YOY paddlefish per trawl haul in 1973. One paddlefish fry was captured during 27 hours of drift netting in 1981. Water release variables from Fort Randall Dam were compared to mean annual trawl indices. No significant (P> 0.05) relationship of any single variable or combination of variables existed. Annual survival of paddlefish below Fort Randall Dam was estimated to be 86% and sport harvest was estimated to be 17% based on tag returns from anglers. A total of 24 paddlefish were equipped with radio tags and movements were followed. Locations of spawning habitat are also discussed.

HARVEST, CREEL CENSUS, ETC.

83-002754 FAO of the UN. 1981 YEARBOOK OF FISHERY STATISTICS: CATCHES AND LANDINGS. Vol. 52. *FAO Fish. Ser.* 18. ix + 357p. 1983. In English, French and Spanish. SFA 28(4)

[Rome, Italy]

83-002755 FAO of the UN. 1981 YEARBOOK OF FISHERY STATISTICS: FISHERY COMMODITIES. Vol. 53. *FAO Fish Ser.* 19. ix + 151p. 1983. In English, French and Spanish. SFA 28(4)

[Rome, Italy]

83-002756 Hicks, C. E.; L. C. Belusz; D. J. Witter and P. S. Haverland. APPLICATION OF ANGLER ATTITUDES AND MOTIVES TO MANAGEMENT STRATEGIES AT MISSOURI'S TROUT PARKS. *Fisheries (Bull. Am. Fish. Soc.)* 8(5):2-7. Sept.-Oct. 1983. SFA 28(4)

[Mo. Dep. Conserv., Jefferson City] The Missouri Department of Conservation manages four fishing areas on spring branches with water sources large enough to permit fish rearing and angling. These special areas, called trout parks, are stocked daily from March to October at a rate of 2.25 trout per anticipated angler. Each angler pays $1.50 for a daily fishing tag, an entitlement to keep five trout. Total revenues collected from the sale of daily tags and annual trout stamps are sufficient to defray costs of operating four trout hatcheries and one trout rearing station. Since 1960, visits to the trout parks have increased at an average annual rate of 4%; about 100,000 daily tags were sold at each park in 1980. In light of physical and fiscal constraints to stocking additional trout, a study was initiated with the goal of developing management responses to increased angler participation. Specific objectives were to determine anglers' motives and attitudes toward selected management alternatives, and

HARVEST, CREEL CENSUS, ETC. (CONTINUED)

83-002756 CONTINUED catch and effort. About 16,000 anglers were contacted during the two year study (1979-1980). The study revealed that (1) angler success is high (80% catch at least one trout), (2) catching fish is a very important aspect of a fishing trip (a finding in contrast to some recent recreational research tending to downplay the importance of the catch), (3) trout park anglers are more tolerant of "crowds" than anglers studied in other settings, and (4) anglers did not support limiting fishing opportunity or the use of daily quotas. Management changes initiated on the basis of study results provide excellent opportunities for anglers to catch trout while reducing only slightly their present opportunities to keep trout. The Department has recently emphasized catch-and-release fishing by zoning areas of the stream, lengthening the fishing season, and motivating anglers to release trout through programs of information and recognition.

83-002757 Hudgins, M. D. AN EVALUATION OF THE FISHERMAN-RESOURCE INTERACTION THROUGH ROVING CREEL SURVEYS ON FOUR RESERVOIRS IN ALABAMA AND GEORGIA. *Ph.D. dissertation, Auburn Univ.* 131p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(1):4. July 1983. SFA 28(4)

One-thousand one-hundred and fifty fishing groups were interviewed during their fishing trips on four reservoirs (two drainages) in Alabama and Georgia from 1980 to 1982. Evaluation of interviewer (creel clerk) performance indicated that data gathering efficiency was affected by fishing effort and by the creel clerk's break-in period. Principal axis factor analysis of the attitudinal questions posed to fishermen during each interview resulted in the formation of two sets of questions that reflected the leisure and the fishing experience. Expectations regarding leisure and fishing were different when anglers were compared based on access type (bank or boat), intended target species, age and drainage fished. Evaluation of interview data indicated that trip quality probably results from the angler's ability to participate in an outdoor leisure experience. Analysis of fish harvest based on mean total number of fish harvested per fishing group indicated that the "predator heavy" reservoirs on the Alabama River drainage provided fewer fish to fishermen than did the "predator light" Chattahoochee River drainage reservoirs. Fishermen were asked to rate their fishing success as poor, fair, good or excellent; total number of fish per group was chosen as the best descriptor of a recreational angler's catch. Anglers did not rate their fishing success (four categories) differently between drainages but adjusted expectations of mean number of fish per success category according to drainage productivity and target-fish abundance. Evaluation of fishing success indicated that an individual's stated fishing success rating was subjective. Objective catch ranges to numbers of fish within a creek limit were developed to operationally define recreational fishing success. These success ranges could be posted at recreational fishing resources to allow anglers to compare their daily harvest to information generated by a catch assessment survey. Over time, the posted information could educate the angling public regarding a resource-specific sport fishing ethic; this new recreational fishery management strategy was named probability angling.

83-002758 Jacobson, J. O.; R. D. Cook and R. Sopuck. AN EVALUATION OF ALTERNATIVE METHODS OF COLLECTING SPORTFISHING STATISTICS FOR THE NORTHWEST TERRITORIES. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1180. iv + 18p. Aug. 1983. In English with French summ. SFA 28(4)

[Dep. Fish. Oceans, Winnipeg, MB R3T 2N6, Canada] This study, as a survey of statistical methods for collecting sportfishing data, outlines the basic data requirements for biological and economic fisheries management. The study examines and evaluates delayed data collection systems, on-site data collection systems and hybrid data collection systems with reference to the

HARVEST, CREEL CENSUS, ETC. (CONTINUED)

83-002758 CONTINUED sport fisheries management requirements of the Northwest Territories. The study recommends the use of a controlled diary system to collect catch and effort data at remote-access lodge fisheries: a catch/effort census for collecting data for road access fisheries; mail questionnaires for gathering general data and trends in catch and effort for intensive/extensive fisheries, and unstructured field checks for providing general information for extensive fisheries. Finally the study outlines the general methodologies to be followed in order to implement the recommended systems.

83-002759 Ketchen, K. S.; N. Bourne and T. H. Butler. HISTORY AND PRESENT STATUS OF FISHERIES FOR MARINE FISHES AND INVERTEBRATES IN THE STRAIT OF GEORGIA, BRITISH COLUMBIA. *Can. J. Fish. Aquatic Sci.* 40(7):1085-1119. July 1983. In English with French summ. SFA 28(4)
[Pac. Biol. Stn., Nainaimo, BC V9R 5K6, Canada]

83-002760 Menz, F. C. and D. P. Wilton. AN ECONOMIC EVALUATION OF THE ST. LAWRENCE RIVER-EASTERN LAKE ONTARIO BASS FISHERY. *NOAA Fish. Bull.* 81(1):168-175. Jan. 1983. SFA 28(4)
[Dep. Econ., Clarkson Coll. Technol., Potsdam, NY 13676]

83-002761 Menz, F. C. and D. P. Wilton. AN ECONOMIC STUDY OF THE MUSKELLUNGE FISHERY IN NEW YORK. *N.Y. Fish Game J.* 30(1):12-29. Jan. 1983. SFA 28(4)
[Sch. Manage., Clarkson Coll. Technol., Potsdam, NY 13676] Data from a 1976-77 survey of licensed resident anglers in New York were analyzed to evaluate the annual recreational benefits of the muskellunge fishery. Participation in muskellunge fishing was significantly influenced by angler preferences, travel costs to angling sites, the proximity of alternative sites, and angler income. The net economic value of the fishery, on a per-day basis, was highest at the St. Lawrence County sites on the St. Lawrence River, while total annual benefits were greatest at the Jefferson County sites on the St. Lawrence River. Simple aggregation over the five muskellunge-fishing sites considered gave a total net annual value to licensed New York resident muskellunge anglers of $1.8 million in 1976, which would be $2.7 million in 1982 dollars. The local economic impact of expenditures by these anglers is also discussed.

83-002762 Ralston, S. and J. J. Polovina. A MULTISPECIES ANALYSIS OF THE COMMERCIAL DEEP-SEA HANDLINE FISHERY IN HAWAII. *NOAA Fish. Bull.* 80(3):435-448. July 1982. SFA 28(4)
[NOAA, P.O. Box 3830, Honolulu, HI 96812]

REGULATIONS

83-002763 Clark, R. D., Jr. POTENTIAL EFFECTS OF VOLUNTARY CATCH AND RELEASE OF FISH ON RECREATIONAL FISHERIES. *N. Am. J. Fish. Manage.* 3(3):306-314. 1983. SFA 28(4)
[Mich. Dep. Nat. Resour., Inst. Fish. Res., Ann Arbor 48109]

FISH CONTROL AND REMOVAL

83-002764 Meffe, G. K. ATTEMPTED CHEMICAL RENOVATION OF AN ARIZONA SPRINGBROOK FOR MANAGEMENT OF THE ENDANGERED SONORAN TOPMINNOW. *N. Am. J. Fish. Manage.* 3(3):315-321. 1983. SFA 28(4)
[Dep. Zool., Ariz. State Univ., Tempe 85287]

83-002765 Meyer, F. P. and R. A. Schnick. SEA LAMPREY CONTROL TECHNIQUES: PAST, PRESENT, AND FUTURE. *J. Great Lakes Res.* 9(3):354-358. 1983. SFA 28(4)
[U.S. FWS, Natl. Fish. Res. Lab., P.O. Box 818, La Crosse, WI 54601] Early attempts at controlling the sea lamprey (*Petromyzon marinus*) in the Great Lakes in the 1950s centered on a variety of mechanical and electrical devices to prevent migration of adults into tributary streams to reproduce. Although some of the devices were effective, it became obvious that barriers alone were not an adequate solution to the lamprey predation problem. Researchers screened over 6,000 chemicals before they found 3-trifluoromethyl-4-nitrophenol (TFM), a toxicant to which sea lamprey larvae and adults are particularly sensitive. Bayer 73 enhances lampricidal activity when used in combination with TFM. In 1970, the U.S. Environmental Protection Agency (EPA) required additional studies to support continued use and registration of TFM. Most of these studies have been completed, but the EPA could cancel the existing registration in the event of unforeseen problems or hazards associated with its use. Therefore, the Great Lakes Fishery Commission continues to support research on lamprey control techniques, such as new formulations of TFM and Bayer 73, sterile male techniques, and attractants and repellents. Development of an integrated management program to combat the sea lamprey is being planned. This concept involves the systematic application of multiple techniques in a way that will exert maximum impact on the sea lamprey. Possible programs may involve chemical, biological, and physical control techniques, each of which would be subject to its own registration or regulatory requirements.

MARKING AND TAGGING

83-002766 Eames, M. J. and M. K. Hino. AN EVALUATION OF FOUR TAGS SUITABLE FOR MARKING JUVENILE CHINOOK SALMON. *Trans. Am. Fish. Soc.* 112(4):464-468. July 1983. SFA 28(4)
[Wash. Dep. Fish., Olympia 98504]

83-002767 Mitani, I. [MORTALITY AND PHYSIOLOGICAL CHANGES OF SARDINE *SARDINOPS MELANOSTICTUS* AFTER TAGGING.] *Bull. Jpn. Soc. Sci. Fish.* 49(7):1049-1055. July 1983. In Japanese with English summ. SFA 28(4)
[Kanagawa Pref. Fish. Exp. Stn., Jogashima, Miura 238-02, Japan]

83-002768 Murphy, B. R.; L. A. Nielsen and B. J. Turner. USE OF GENETIC TAGS TO EVALUATE STOCKING SUCCESS FOR RESERVOIR WALLEYES. *Trans. Am. Fish. Soc.* 112(4):457-463. July 1983. SFA 28(4)
[Dep. Range Wildl. Manage., Texas Tech Univ., Box 4169, Lubbock 79409]

83-002769 Wetherall, J. A. ANALYSIS OF DOUBLE-TAGGING EXPERIMENTS. *NOAA Fish. Bull.* 80(4):687-701. Oct. 1982. SFA 28(4)
[NMFS, P.O. Box 3830, Honolulu, HI 96812]

STOCKING AND INTRODUCTIONS

83-002770 Cresswell, R. C. and R. Williams. POST-STOCKING MOVEMENTS AND RECAPTURE OF HATCHERY-REARED TROUT RELEASED INTO FLOWING WATERS--EFFECT OF PRIOR ACCLIMATION TO FLOW. *J. Fish Biol.* 23(3):265-276. Sept. 1983. SFA 28(4)

[Amenity, Fish. Rec. Dep., Yorkshire Water Authority, 21 Park Square South, Leeds LS1 2QG, England] Hatchery-reared brown trout, *Salmo trutta*, (F.L., 16-27 cm) were stocked into the Afon Clettwr, Afon Western Cleddau and Afon Dysynni, Wales. The effects of (a) retaining fish caged in the river for 24 h before release, and (b) a period of acclimation to flowing water (up to 0.24 m s^{-1}) in tanks prior to stocking were investigated. Data on percentage recapture and post-stocking movements were obtained from trapping, electrofishing and tag returns. In-stream acclimation resulted in a higher percentage recapture and a more limited dispersion of the fish stocked under low river flow conditions, but had no effect on trout stocked into a river where higher water velocities were experienced. Acclimation, in tanks, to a flow of 0.1 m s^{-1} for 14 days led to higher percentage recaptures, whereas acclimation for only 2 days resulted in fewer returns than for unacclimated fish. No differences in fish distribution within the rivers could be attributed to these acclimation procedures.

83-002771 Hoover, F. and J. A. St. Amant. RESULTS OF MOHAVE CHUB, *GILA BICOLOR MOHAVENSIS*, RELOCATIONS IN CALIFORNIA AND NEVADA. *Calif. Fish Game* 69(1):54-56. Jan. 1983. SFA 28(4)

[Calif. Dep. Fish Game, 15378 Bird Farm Rd., Chino, CA 91710]

83-002772 Klein, W. D. LAKE DeSMET RAINBOW TROUT IN PARVIN LAKE, COLORADO, 1972-1978. *Colo. Div. Wildl. Spec. Rep.* No. 55. vi + 10p. Sept. 1983. SFA 28(4)

[Colo. Div. Wildl, 317 W. Prospect, Fort Collins 80526] Two plants of Lake DeSmet fingerling rainbow trout were made at Parvin Lake, Colorado, one in 1972 and the other in 1973. The 1972 release was accompanied by a similar but larger group of domestic strain rainbow trout. The plants were identified by different fin clips. Observations on growth, angler catch, seasonal harvest pattern, and longevity did not suggest an advantage of the DeSmet over the domestic strain trout. DeSmet fish, however, entered inlet and outlet traps as spawners in proportionately greater numbers than did the domestic strain fish. Also, the contribution of smolts to the outlet trap was dominated by DeSmet fish.

83-002773 Serns, S. L. and L. M. Andrews. SURVIVAL AND GROWTH OF MUSKELLUNGE FINGERLINGS STOCKED IN FOUR VILAS COUNTY, WISCONSIN LAKES. *Wis. Dep. Nat. Resour. Fish Manage. Rep.* 116. 15p. June 1983. SFA 28(4)

[Bur. Fish Manage., Wis. Dep. Nat. Resour., Madison] Four-, eight- and twelve-inch muskellunge fingerlings were stocked at the rate of 4/acre in four Vilas County lakes in 1976 and 1977, and their subsequent survival and growth were evaluated. Short- and long-term survival of all three size groups was similar in Arrowhead Lake for fish stocked in 1976, while short- and long-term survival for muskellunge fingerlings stocked in Arrowhead Lake in 1977 was highest for stocked 12-inch fingerlings. Survival was also highest for the 12-inch fingerlings stocked in Brandy and Johnson lakes in both 1976 and 1977, while survival of all three size groups in Sparkling Lake was negligible both years. Growth of the muskellunge fingerlings stocked in Arrowhead Lake was better than the growth of fingerlings in hatchery rearing ponds. The good survival and growth of fingerlings stocked in Arrowhead Lake can probably be attributed to the low density of northern pike and other potential predators, and an abundant supply of young-of-the-year perch in 1976 and 1977. The yellow perch probably provided a food source for

STOCKING AND INTRODUCTIONS (CONTINUED)

83-002773 CONTINUED the stocked muskellunge and served as a buffer from would-be predators. This study indicated that small muskellunge fingerlings (approximately 4 inches) can contribute to a sport fishery when stocked in a lake with a low density of predators and a good supply of suitable forage. It is recommended that only large (12 inches or larger) fingerlings be stocked where there is a moderate-to-large northern pike (predator) population.

83-002774 Smirnov, Y. A.; Y. A. Shustov and I. L. Shchurov. BEHAVIOR OF HATCHERY SALMON PARR, *SALMO SALAR* (SALMONIDAE), IN RELATION TO STOCKING. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(1):85-95. 1983. SFA 28(4)
[Inst. Biol., Karelian Branch, Acad. Sci., Petrozavodsk, USSR] The behavior and distribution of hatchery reared Atlantic salmon parr, *Salmo salar* (age 2+ years), in the Kanda and Luven'ga Rivers (White Sea basin) were studied. The juvenile salmon inhabited the rapids and riffles, however, a lack of suitable habitat may be the reason for mass-scale migration from the river.

83-002775 Swink, W. D. SURVEY OF STOCKING POLICIES FOR TAILWATER TROUT FISHERIES IN THE SOUTHERN UNITED STATES. *Prog. Fish-Cult.* 45(2):67-71. Apr. 1983. SFA 28(4)
[Hammond Bay Biol. Stn., RFD Box 44, Millersburg, MI 49759]

83-002776 Vreeland, R. R. and R. J. Wahle. HOMING AND FISHERIES CONTRIBUTION OF MARKED COHO SALMON, *ONCORHYNCHUS KISUTCH*, RELEASED AT TWO COLUMBIA RIVER LOCATIONS. *NOAA Fish. Bull.* 81(1):143-148. Jan. 1983. SFA 28(4)
[NMFS, 847 N.E. 19th Ave., Suite 350, Portland, OR 97232]

83-002777 Welcomme, R. L.; C. C. Kohler and W. R. Courtenay, Jr. STOCK ENHANCEMENT IN THE MANAGEMENT OF FRESHWATER FISHERIES: A EUROPEAN PERSPECTIVE. *N. Am. J. Fish. Manage.* 3(3):265-275. 1983. SFA 28(4)
[W. R. Courtenay, Jr.: Dep. Biol. Sci., Fla. Atl. Univ., Boca Raton, FL 33431]

83-002778 Williams, R. RELEASES OF COHO SALMON INTO THE UPPER WILLAMETTE RIVER, OREGON. *Oreg. Dep. Fish Wildl. Fish Div. Inf. Rep.* 83-3. 47p. Feb. 1983. SFA 28(4)
[Oreg. Dep. Fish Wildl., Res. Dev. Sect., Corvallis]

FISHING GEAR AND TECHNIQUES

83-002779 Arimoto, T. [CATCH VARIATION WITH OPERATION TIME IN COASTAL SET-LINE.] *Bull. Jpn. Soc. Sci. Fish.* 49(7):1045-1048. July 1983. In Japanese with English summ. SFA 28(4)
[Dep. Fish. Sci. Technol., Tokyo Univ. Fish., Konan-4, Minato-ku, Tokyo 108, Japan]

83-002780 Arimoto, T.; M. Ogura and Y. Inoue. [CATCH VARIATION WITH IMMERSION TIME OF GEAR IN COASTAL SET-LINE.] *Bull. Jpn. Soc. Sci. Fish.* 49(5):705-709. May 1983. In Japanese with English summ. SFA 28(4)

FISHING GEAR AND TECHNIQUES (CONTINUED)

83-002780 CONTINUED
[Dep. Fish. Sci. Technol., Tokyo Univ. Fish., Konan 4, Minato-ku, Tokyo 108, Japan]

83-002781 Avedikova, T. M.; G. P. D'yakovà; L. V. Kukarina; G. I. Luts; I. M. Nikul'shin; J. V. Pryakhin; J. I. Rekov; S. F. Rogov and L. V. Romanovich. [ON THE STOCKS OF PRINCIPAL COMMERCIAL SPECIES OF FISH FROM THE AZOV SEA.] *Biological Productivity in the Azov and Caspian Seas. VNIRO, Moscow, USSR.* p. 28-44. 1982. In Russian with English summ. SFA 28(4)

In the recent period characterized by the regulated discharge of rivers, uncompensated withdrawl of water and re-distribution of the river runoff the state of fish populations in the Azov Sea depends not only on the reproduction conditions, but also on the feeding conditions in the sea. In the period when the amount of fresh water was the least (1969-1976) the growth rate of older age groups of demersal species got lower by 5-40%, of pelagic species almost by 10%. Their fat content got lower by 1.5 times. The comparison of the aboundance of fish in two recent decades indicates that the stocks of pike-perch have declined by 1.5 times, of bream by 2 times, of roach by 6.6 times, of herring by 3 times, of tiulka by 1.4 times and of goby by 4.5 times. The stocks of most valuable aboriginal species have increased by 3 times owing to rather successful artificial propagation of sturgeon, their high euryhaline capacity and availability of food. The stocks of turbot and anchovy from the Mediterranean Sea community have increased by 1.5 times. In 1978-1980 the river runoff increased, so the general conditions in the sea became better for fish populations and their food resources. As a result abundant year-classes of some species of fish (sturgeon, bream, pike-perch and anchovy) appeared and the stocks are expected to increase. Sturgeons are the most promising species for increasing productivity in the sea when the salinity values reach 13-14^{o}/oo.

83-002782 Bronte, C. R. and D. W. Johnson. OCCURRENCE OF SPORT FISH IN A COMMERCIAL NET FISHERY IN KENTUCKY. *N. Am. J. Fish. Manage.* 3(3):239-242. 1983. SFA 28(4)
[Hancock Biol. Stn., Murray State Univ., Murray, KY 42071]

83-002783 Gale, W. BUCKETED DIP NET TO COLLECT ZOOPLANKTON AND LARVAL FISH. *Prog. Fish-Cult.* 45(2):102. Apr. 1983. SFA 28(4)
[Ichthyological Assoc., Inc., R. D. 1, Berwick, PA 18603]

83-002784 Heidinger, R. C.; D. R. Helms; T. I. Hiebert and P. H. Howe. OPERATIONAL COMPARISON OF THREE ELECTROFISHING SYSTEMS. *N. Am. J. Fish. Manage.* 3(3):254-257. 1983. SFA 28(4)
[South. Ill. Univ., Carbondale 62901]

83-002785 Koike, T. [THE CHARACTERISTICS OF THE FISHING TACKLE IN YELLOW-TAIL TROLL FISHING.] *Bull. Jpn. Soc. Sci. Fish.* 49(7):993-1000. July 1983. In Japanese with English summ. SFA 28(4)
[Tokyo Univ. Fish., Konan-4, Minato, Tokyo 108, Japan]

83-002786 Lee, J.; K. Kanda and O. Sato. COMPARISON OF FISHING ABILITY BY CATCH PER DRAUGHT OF OFFSHORE TRAWL FISHERIES AROUND CHOSHI. *Bull. Jpn. Soc. Sci. Fish.* 49(6):853-858. June 1983. In Japanese with English summ. SFA 28(4)
[Fac. Fish., Hokkaido Univ., Hakodate 041, Japan]

FISHING GEAR AND TECHNIQUES (CONTINUED)

83-002787 Lee, J.; K. Kanda and O. Sato. THE RELATION BETWEEN FISHING GEAR AND FISHING ABILITY FOR OFFSHORE TRAWL FISHERIES AROUND CHOSHI. *Bull. Jpn. Soc. Sci. Fish.* 49(6):859-866. June 1983. In Japanese with English summ. SFA 28(4)
[Fac. Fish., Hokkaido Univ., Hakodate 041, Japan]

83-002788 Leslie, J. K.; J. E. Moore; W. H. Hyatt and C. A. Timmins. SEINE FOR SAMPLING LARVAL FISH IN SHALLOW WATER. *Prog. Fish-Cult.* 45(2):130-131. Apr. 1983. SFA 28(4)
[Great Lakes Fish. Res. Br., Can. Cent. Inland Waters, 867 Lakeshore Rd., P.O. Box 5050, Burlington, ON L7R 4A6, Canada]

83-002789 Maéda, H.; K. Fukada and N. Iwasaki. [SHOOTING AND HAULING SPEEDS OF ROCKFISH BOTTOM LONGLINE.] *Bull. Jpn. Soc. Sci. Fish.* 49(7):1029-1037. July 1983. In Japanese with English summ. SFA 28(4)
[Shimonoseki Univ. Fish., Yoshimi, Shimonoseki 759-65, Japan]

83-002790 Main, J. and G. I. Sangster. FISH REACTIONS TO TRAWL GEAR--A STUDY COMPARING LIGHT AND HEAVY GROUND GEAR. *Scott. Fish. Res. Rep.* No. 27. 17p. 1983. SFA 28(4)
[Mar. Lab., Aberdeen, Scotland]

83-002791 Miller, R. J. CONSIDERATIONS FOR CONDUCTING FIELD EXPERIMENTS WITH BAITED TRAPS. *Fisheries (Bull. Am. Fish. Soc.)* 8(5):14-17. Sept.-Oct. 1983. SFA 28(4)
[Halifax Lab., Can. Dep. Fish. Oceans, Halifax, NS, Canada] The uncontrolled variables, the large number of variables potentially testable, and the exigencies of field operations are all distractions which can compromise the quality of field experiments. Catch records from fisherman's logbooks are not good substitutes for experimental fishing. They rarely, if ever, meet experimental assumptions on randomization of treatments over space and time, and the quality of the recorded data can be wanting. A review of studies on catch per baited trap versus soak time gave peak catches at 3 to 10 days when data were taken from logbooks, and 0.1 and 2 days when data were taken from experimental fishing, suggesting a systematic bias in the logbook data. Experiments with baited traps usually measure effects of soak time, trap design, or bait type on catch per trap. In these cases preliminary trapping is important for locating an area of approximately uniform catch rates (uniformity trial), to determine the necessary sample size for desired precision, and to solve logistical problems. Variability among replicates is minimized by choosing an area of uniform catch rates and by using uniform technique with regard to bait quality and quanity, soak time, and trap quality. Fishing a few traps carefully is preferable to fishing many uncarefully.

83-002792 Miyauchi, M.; H. Shinomiya and K. Sami. [CHARACTERISTIC OF BREAKING RATE OF TUNA LONG LINE.] *Bull. Jpn. Soc. Sci. Fish.* 49(6):889-894. June 1983. In Japanese with English summ. SFA 28(4)
[Coll. Agric. Vet. Med., Nihon Univ., 3-34, Shimouma, Setagaya-ku, Tokyo 154, Japan]

83-002793 Rutecki, T. L.; P. J. Schneeberger and D. J. Jude. DIVER AND UNDERWATER TELEVISION OBSERVATIONS OF FISH BEHAVIOR IN A GREAT LAKES COMMERCIAL TRAP NET. *J. Great Lakes Res.* 9(3):359-364. 1983. SFA 28(4)
[Great Lakes Res. Div., Univ. Mich., Ann Arbor 48109]

FISHING GEAR AND TECHNIQUES (CONTINUED)

83-002794 Weber, A. M. and P. T. Briggs. RETENTION OF BLACK SEA BASS IN VENTED AND UNVENTED LOBSTER TRAPS. *N. Y. Fish Game J.* 30(1):67-77. Jan. 1983. SFA 28(4)
[N. Y. State Dep. Environ. Conserv., Stony Brook 11794] Field collections showed no significant differences in the numbers and mean total lengths of black sea bass retained by vented vs. unvented lobster traps. While linear regression analysis of morphometric characters of black sea bass indicated that traps equipped with 58-millimeter escape vents would not retain fish less than 210 millimeters in total length, in practice both vented and unvented traps retained equal proportions of such small bass. Analysis of the lobster catch agreed with other studies that traps equipped with escape vents took fewer sub-legal lobsters while catching more legal-sized lobsters.

83-002795 Wiley, M. L. and C. Tsai. THE RELATIVE EFFICIENCIES OF ELECTROFISHING VS. SEINES IN PIEDMONT STREAMS OF MARYLAND. *N. Am. J. Fish. Manage.* 3(3):243-253. 1983. SFA 28(4)
[Univ. Md. Cent. Environ. Estuarine Stud., Chesapeake Biol. Lab., Solomons 20688-0038]

83-002796 Yamamoto, K. [TENSILE BEHAVIOUR OF TWISTED NYLON MONOFILAMENTS.] *Bull. Jpn. Soc. Sci. Fish.* 49(5):671-678. May 1983. In Japanese with English summ. SFA 28(4)
[Fac. Fish., Hokkaido Univ., Minato, Hakodate 041, Japan]

FERTILIZATION OF SOIL AND WATER

83-002797 Mundie, J. H.; S. M. McKinnell and R. E. Traber. RESPONSES OF STREAM ZOOBENTHOS TO ENRICHMENTS OF GRAVEL SUBSTRATES WITH CEREAL GRAIN AND SOYBEAN. *Can. J. Fish. Aquatic Sci.* 40(10):1702-1712. Oct. 1983. In English with French summ. SFA 28(4)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC.

83-002798 Hanson, C. H. and H. W. Li. BEHAVIORAL RESPONSE OF JUVENILE CHINOOK SALMON, *ONCORHYNCHUS TSHAWYTSCHA*, TO TRASH RACK BAR SPACING. *Calif. Fish Game* 69(1):18-22. Jan. 1983. SFA 28(4)
[TERA Corp., 2150 Shattuck Ave., Berkeley, CA 94704] The behavioral response of juvenile chinook salmon, *Oncorhynchus tshawytscha*, to vertical trash racks having interbar spacings ranging from 5.1 to 30.5 cm is reported. Experiments were conducted in a laboratory channel with an average water velocity of 32 cm/sec under light intensities of 14.0 and 1.0 X 10^{-2} footcandles. Transit times were not significantly different between light levels, but differences between bar spacings were significant. Observed changes in rheotaxic posture and hesitancy to pass through a trash rack with bar spacing less than 15 cm would increase the susceptibility of juvenile fish to predation.

83-002799 Kokulina, G. M. and R. P. Khodorevskaya. [THE APPLICATION OF ECOLOGICAL METHODS FOR PROTECTION OF STURGEON FINGERLINGS FROM ENTERING THE WATER INTAKE.] *Biological Productivity in the Azov and Caspian Seas.*

FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC. (CONTINUED)

83-002799 CONTINUED *VNIRO, Moscow, USSR.* p. 75-88. 1982. In Russian with English summ. SFA 28(4)

83-002800 Willis, D. F. INDEXING OF JUVENILE SALMONIDS MIGRATING PAST THE DALLES DAM, 1982. *Oreg. Dep. Fish Wildl. Fish Div. Proj. Rep.* v+50p. 1983. SFA 28(4)

[Oreg. Dep. Fish Wildl., 506 S.W. Mill St., P.O. Box 3503, Portland, OR 97208] The Dalles Dam (TDD) sluiceway was operated as a juvenile salmonid bypass system according to optimum criteria for 16 h/d , and bypassed salmonids were continually sampled using an airlift trap from April 26 through July 4, 1982. Fish marked and released upstream by the NMFS and other agencies were recovered to estimate travel time from point of release to TDD, but survival could not be estimated. The bypass efficiency of the sluiceway was estimated from marked fish releases and found to be related to percentage spill by an inverse exponential relationship ($r^2 = 0.96$). Maximum bypass efficiency was projected to be approximately 40% when no spilling occurs. Assuming a constant bypass efficiency with respect to fish passing the powerhouse, approximately 70% of juveniles passing the project were passed through spill (50%) or the sluiceway (20%) when a 20% spilling rate occurred. The effect of spilling on sluiceway fish bypass efficiency precludes use of the airlift trap for indexing. The mean descaling rates for subyearling chinook and for yearling coho salmon passing through the trap were 5.98% and 2.31% respectively. High variation in the results of 72 h delayed mortality tests for these species prevented drawing conclusions regarding mortality to fish captured with the trap.

MATHEMATICS, STATISTICAL METHODS, AND MODELING

83-002801 Bukhanevich, I. B. and Drapatskij, M. Y. [TO THE APPLICATION OF THE SYSTEMS ANALYSIS METHODS IN THE MANAGEMENT OF FISHERIES AND REPRODUCTION OF FISH STOCKS.] *Biological Productivity in the Azov and Caspian Seas. VNIRO, Moscow, USSR.* p. 12-28. 1982. In Russian with English summ. SFA 28(4)

83-002802 Fournier, D. A. AN ANALYSIS OF THE HECATE STRAIT PACIFIC COD FISHERY USING AN AGE-STRUCTURED MODEL INCORPORATING DENSITY-DEPENDENT EFFECTS. *Can. J. Fish. Aquatic Sci.* 40(8):1233-1243. Aug. 1983. In English with French summ. SFA 28(4)

[Statistics Canada, Struct. Anal. Div., R. H. Coats Bldg. 24th floor, Ottawa, ON K1A 0T6, Canada]

83-002803 Hannesson, R. BIOECONOMIC PRODUCTION FUNCTION IN FISHERIES: THEORETICAL AND EMPIRICAL ANALYSIS. *Can. J. Fish. Aquatic Sci.* 40(7):968-982. July 1983. In English with French summ. SFA 28(4)

[Dep. Econ., Univ. Bergen, Jonas Reinsgt. 19, N-5014 Bergen-U, Norway]

83-002804 Knechtel, C. D. A NUMERICAL SIMULATION MODEL OF THE POPULATION DYNAMICS OF WALLEYE POLLOCK, *THERAGRA CHALCOGRAMMA* (PALLAS 1811), IN A SIMPLIFIED ECOSYSTEM. *M.S. thesis, Univ. Wash.* 542p. 1983. Abstract only. From Masters Abstr. 21(3):228. Sept. 1983. SFA 28(4)

This thesis describes an age-structured energetics and population model of walleye pollock, *Theragra chalcogramma*, in a simplified Bering Sea

MATHEMATICS, STATISTICAL METHODS, AND MODELING (CONTINUED)

83-002804 CONTINUED ecosystem consisting of phytoplankton, copepods, and euphausiids. Simulation objectives were to study theoretical effects of linkages among energy flow, recruitment, mortality (especially cannibalism), and fecundity on pollock population dynamics and fishery yields. Model calibration was accomplished by manual variation of parameters until target criteria were met. For validation, comparisons were made to actual data; results indicated the model is useful, but improvements may be possible. Model dynamics showed equilibrium, periodic, or pseudo-random behavior. The pollock population may recover from severe overfishing. More than 5 fold increases in fishery yields may be possible; harmful side effects might occur in some cases. Results were sensitive to parameter values. Studies are suggested which may improve model usefulness and validity.

83-002805 Pauly, D. SOME SIMPLE METHODS FOR THE ASSESSMENT OF TROPICAL FISH STOCKS. *FAO Fish Tech. Pap.* No. 234. viii + 52 p. 1983. SFA 28(4)
[MCC, P.O. Box 1501, Makati, Metro Manila, Philippines]

83-002806 Pollock, K. H. and R. H. K. Mann. USE OF AN AGE-DEPENDENT MARK-RECAPTURE MODEL IN FISHERIES RESEARCH. *Can. J. Fish. Aquatic Sci.* 40(9):1449-1455. Sept. 1983. In English with French summ. SFA 28(4)
[Dep. Stat., N.C. State Univ., Box 5457, Raleigh, NC 27650]

83-002807 Roff, D. A. AN ALLOCATION MODEL OF GROWTH AND REPRODUCTION IN FISH. *Can. J. Fish. Aquatic Sci.* 40(9):1395-1404. Sept. 1983. In English with French summ. SFA 28(4)
[Dep. Biol., McGill Univ., 1205 Ave. Dr. Penfield, Montreal, PQ H3A 1B1, Canada]

83-002808 Roff, D. A. ANALYSIS OF CATCH/EFFORT DATA: A COMPARISON OF THREE METHODS. *Can. J. Fish. Aquatic Sci.* 40(9):1496-1506. Sept. 1983. In English with French summ. SFA 28(4)
[Dep. Biol., McGill Univ., 1250 Ave. Dr. Penfield, Montreal, PQ H3A 1B1, Canada]

83-002809 Schnute, J. and J. Sibert. THE SALMON TERMINAL FISHERY: A PRACTICAL, COMPREHENSIVE TIMING MODEL. *Can. J. Fish. Aquatic Sci.* 40(7):835-853. July 1983. In English with French summ. SFA 28(4)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

LAKE MANAGEMENT AND RESEARCH

83-002810 Barica, J.; J. Gibson and W. Howard. FEASIBILITY OF SNOW CLEARING TO IMPROVE DISSOLVED OXYGEN CONDITIONS IN A WINTERKILL LAKE. *Can. J. Fish. Aquatic Sci.* 40(9):1526-1531. Sept. 1983. In English with French summ. SFA 28(4)
[Can. Cent. Inland Waters, P.O. Box 5050, Burlington, ON L7R 4A6, Canada]

83-002811 Gophen, M.; R. W. Drenner and G. L. Vinyard. CICHLID STOCKING AND THE DECLINE OF THE GALILEE SAINT PETER'S FISH (*SAROTHERODON GALILAEUS*) IN LAKE KINNERET, ISRAEL. *Can. J. Fish. Aquatic Sci.*

LAKE MANAGEMENT AND RESEARCH (CONTINUED)

83-002811 CONTINUED 40(7):983-986. July 1983. In English with French summ. SFA 28(4)
[Kinneret Limnol. Lab., P.O. Box 345, Tiberias, 14-102 Israel]

83-002812 Johnson, L. HOMEOSTATIC CHARACTERISTICS OF SINGLE SPECIES FISH STOCKS IN ARCTIC LAKES. *Can. J. Fish. Aquatic Sci.* 40(7):987-1024. July 1983. In English with French summ. SFA 28(4)
[Freshwater Inst., 501 University Crescent, Winnipeg, MB R3T 2N6, Canada]

83-002813 Löffler, H. ASPECTS OF THE HISTORY AND EVOLUTION OF ALPINE LAKES IN AUSTRIA. *Hydrobiologia* 100:143-152. 1983. SFA 28(4)
[Dep. Limnol., Zool. Inst., Univ. Vienna, Althanstr. 14, 1090 Vienna, Austria]

83-002814 Schiavone, A., Jr. THE BLACK LAKE FISH COMMUNITY: 1931 to 1979. *N.Y. Fish Game J.* 30(1):78-90. Jan. 1983. SFA 28(4)
[N.Y. State Dep. Environ. Conserv., Watertown 13601] Significant changes in the fish community in Black Lake have taken place since 1931, the most important being the decline of the walleye population following the establishment of the black crappie in the late 1950's. During the 1970's the fish community was dominated by pan-fish, primarily black crappie, yellow perch and pumpkinseeds. Data collected from 1975 to 1979 suggest that the dynamics of this community have been strongly influenced by dominant year classes of the black crappie which apparently suppressed recruitment of its own young along with those associated species. A period of unstable walleye recruitment in the late 1960's may have allowed the black crappie to produce large year classes. Competition for forage fish from these large year classes may have increased the vulnerability of adult walleyes to being taken by angling. Coupled with crappie predation on walleye fry, this may have eventually reduced stocks below viable levels. Other changes in species composition and growth rates are discussed.

83-002815 Schlesinger, D. A. and A. M. McCombie. AN EVALUATION OF CLIMATIC, MORPHOEDAPHIC, AND EFFORT DATA AS PREDICTORS OF YIELDS FROM ONTARIO SPORT FISHERIES. *Ont. Fish. Tech. Rep. Ser.* No. 10. iii+14p. 1983. SFA 28(4)
[Ontario Minist. Nat. Resour., Res. Sect., Fish Br., Maple, ON L0J 1E0, Canada] The purpose of this study was to determine the relative usefulness of the morphoedaphic index (MEI = total dissolved solids/mean depth), angling effort (E), lake surface area (A), and long-term mean annual air temperature in the lake vicinity (TEMP) for predicting sport fishing yields (Y) for a set of 85 Ontario lakes, 6 Minnesota lakes, and Lake Tahoe, California. Angling effort proved to be the best single independent variable, producing the equation: $\log_{10}Y = 0.668(\log_{10}E) - 0.507$ with $r^2 = 0.611$ where Y is stated in kg/ha/yr and E in angler-hours/ha/yr. A multiple regression equation of the form: $\log_{10}Y = 0.564(\log_{10}E) + 0.548(\log_{10}\mathrm{MEI}) - 0.181(\log_{10}\mathrm{MEI})^2 - 0.614$ with $r^2 = 0.748$ where the MEI is given in mg/l/m, considerably improved the correlation. In contrast, lake surface area and TEMP were of questionable value as independent variables as indicated by a step-wise regression analysis.

RIVER AND STREAM MANAGEMENT AND RESEARCH

83-002816 Avery, E. L. A BIBLIOGRAPHY OF BEAVER, TROUT, WILDLIFE, AND FOREST RELATIONSHIPS. WITH SPECIAL REFERENCE TO BEAVER AND TROUT. *Wis. Dep. Nat. Resour. Tech. Rep.* No. 137. 23p. 1983. SFA 28(4)

[Wis. Dep. Nat. Resour., P.O. Box 7921, Madison, WI 53707] A total of 446 references to beaver (*Castor canadensis*) ecology and the relationships of beaver to trout, waterfowl and other wildlife, and forests are presented. Annotations of 36 papers selected from the general references deal specifically with the relationship of beaver and their activities to wild trout in low to moderately high gradient streams in Wisconsin (10), Michigan (9), Minnesota (10), New York (5), Maine (2), Massachusetts (1), and Ontario (1).

83-002817 Berezovskaya, V. I.; E. P. Tsunikova; L. E. Tevyashova; M. S. Chebanov and T. M. Popova. [THE STATE OF THE REPRODUCTION OF ABUNDANT SPECIES OF FISH IN THE KUBAN RIVER BASIN.] *Biological Productivity in the Azov and Caspian Seas. VNIRO, Moscow, USSR.* p. 94-101. 1982. In Russian with English summ. SFA 28(4)

83-002818 Crisp, D. T.; R. H. K. Mann and P. R. Cubby. EFFECTS OF REGULATION OF THE RIVER TEES UPON FISH POPULATIONS BELOW COW GREEN RESERVOIR. *J. Appl. Ecol.* 20(2):371-386. Aug. 1983. SFA 28(4)

[Freshwater Biol. Assoc., The Ferry House, Far Sawrey, Ambleside, England] The population density, growth, biomass, fecundity and production of bullhead (*Cottus gobio* L.) and brown trout (*Salmo trutta* L.) were estimated in the River Tees below the regulating reservoir at Cow Green. Comparisons were made with estimates obtained for the same site before impoundment, and with data from Maize Beck, an unregulated tributary of the Tees below the reservoir. Changes in the growth of trout were negligible, but there was an apparent decrease in the observed lengths of 0 group bullheads in the regulated Tees. This may reflect a shorter growing season because bullheads spawned later in the Tees after impoundment, possibly in response to the delay in the increase in water temperature during the spring. There were marked annual variations in the numbers of brown trout and bullhead, but population densities of both species increased in the Tees following regulation. The numbers of trout (excluding the 0 group) increased from 3.5 to 4.9 100 m^{-2}. For bullheads the largest increases occurred in the I and II age-groups: 9.5 to 81.5 100 m^{-2} and 5.2 to 24.4 100 m^{-2} respectively. The numbers of both species were significantly higher ($P<0.05$) in the Tees than in Maize Beck during both periods. The annual instantaneous mortality rate of bullheads increased from 0.67 ± 0.21 to 1.30 ± 0.68 in the Tees following impoundment, corresponding values for Maize Beck were 0.68 ± 0.25 and 0.81 ± 0.22. The mean fecundity of individual female bullheads of any given size decreased in the Tees, but remained the same in Maize Beck. The increase in population density in the Tees caused a significant increase ($P<0.05$) in the number of eggs laid each year by the whole population from 3.70 to 8.42 eggs m^{-2}. The corresponding values in Maize Beck of 2.04 and 2.28 eggs m^{-2} were not significantly different ($P>0.05$). Only very approximate values were obtained for annual production of trout. Estimated bullhead production increased slightly at Maize Beck and by a factor of three in the Tees, largely as a result of increases in 0 and I group production. Annual production by older fish changed little. The results suggest that the combination of environmental changes caused by regulation has improved conditions for the downstream fish populations. This has been exploited by the bullheads and trout mainly through increased population density and population biomass, rather than through any marked increase in the growth rate of individual fish. This would be expected because growth rate appears to be limited mainly by water temperature.

RIVER AND STREAM MANAGEMENT AND RESEARCH (CONTINUED)

83-002819 Ehrlich, T. OPPORTUNITIES TO PROTECT INSTREAM FLOWS IN GEORGIA. *U.S. Fish Wildl. Serv.* FWS/OBS-83/20. xiii + 28p. Aug. 1983. SFA 28(4)
[U.S. FWS, 2625 Redwing Rd., Fort Collins, CO 80526]

83-002820 Hawkins, C. P.; M. L. Murphy; N. H. Anderson and M. A. Wilzbach. DENSITY OF FISH AND SALAMANDERS IN RELATION TO RIPARIAN CANOPY AND PHYSICAL HABITAT IN STREAMS OF THE NORTHWESTERN UNITED STATES. *Can. J. Fish. Aquatic Sci.* 40(8):1173-1185. Aug. 1983. In English with French summ. SFA 28(4)
[Dep. Fish. Wildl., UMC 52, Utah State Univ., Logan 84322]

83-002821 Olive, S. W. PROTECTING INSTREAM FLOWS IN IOWA: AN ADMINISTRATIVE CASE STUDY. *U.S. Fish Wildl. Serv.* FWS/OBS-83/18 v + 35p. Aug. 1983. SFA 28(4)
[U.S. FWS, 2627 Redwing Rd., Fort Collins, CO 80526]

83-002822 Platts, W. S. and R. L. Nelson. THE ELECTRONIC CAPACITANCE METER: A TOOL FOR EVALUATING RIPARIAN-FISHERY HABITAT. *N. Am. J. Fish. Manage.* 3(3):219-227. 1983. SFA 28(4)
[USDA For. Serv., For. Sci. Lab., Boise, ID 83702]

83-002823 Skinner, M. M. and M. D. Stone. IDENTIFICATION OF INSTREAM HAZARDS TO TROUT HABITAT QUALITY IN WYOMING. *U.S. Fish Wildl. Serv.* FWS/OBS-83/13. ix + 69p. Mar. 1983. SFA 28(4)
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83-002824 Vance, J. M. THE SMALLMOUTH SAGA. *Mo. Conserv.* 44(8):10-15. Aug. 1983. SFA 28(4)
[Mo. Dep. Conserv., P.O. Box 180, Jefferson City 65102]

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83-002825 Adams, S. M.; B. L. Kimmel and G. R. Ploskey. SOURCES OF ORGANIC MATTER FOR RESERVOIR FISH PRODUCTION: A TROPHIC-DYNAMICS ANALYSIS. *Can. J. Fish. Aquatic Sci.* 40(9):1480-1495. Sept. 1983. In English with French summ. SFA 28(4)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

83-002826 Bennett, D. H.; P. M. Bratovich; W. Knox; D. Palmer and H. Hansel. STATUS OF THE WARMWATER FISHERY AND THE POTENTIAL OF IMPROVING WARMWATER FISH HABITAT IN THE LOWER SNAKE RESERVOIRS. *U.S. Army Corps Eng.* 492p. Jan. 1983. SFA 28(4)
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83-002827 Pivnička, K. LONG-TERMED STUDY OF FISH POPULATIONS IN THE KLÍČAVA RESERVOIR. *Acta Sci. Nat. Acad. Sci. Bohemoslov. Brno Nov. Ser.* 16(10):1-146. 1982. In English with Russian summ. SFA 28(4)

ESTUARY MANAGEMENT AND RESEARCH

83-002828 Allen, L. G. SEASONAL ABUNDANCE, COMPOSITION, AND PRODUCTIVITY OF THE LITTORAL FISH ASSEMBLAGE IN UPPER NEWPORT BAY, CALIFORNIA. *NOAA Fish. Bull.* 80(4):769-790. Oct. 1982. SFA 28(4)
[Dep. Biol., Calif. State Univ., Northridge, CA 91330]

83-002829 Potter, I. C.; N. R. Loneragan; R. C. J. Lenanton; P. J. Chrystal and C. J. Grant. ABUNDANCE, DISTRIBUTION AND AGE STRUCTURE OF FISH POPULATIONS IN A WESTERN AUSTRALIAN ESTUARY. *J. Zool. (Lond.)* 200(1):21-50. May 1983. SFA 28(4)
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MARINE MANAGEMENT AND RESEARCH

83-002830 Archibald, C. P.; D. Fournier and B. M. Leaman. RECONSTRUCTION OF STOCK HISTORY AND DEVELOPMENT OF REHABILITATION STRATEGIES FOR PACIFIC OCEAN PERCH IN QUEEN CHARLOTTE SOUND, CANADA. *N. Am. J. Fish. Manage.* 3(3):283-294. 1983. SFA 28(4)
[B. M. Leaman: Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

83-002831 Bell, J. D. EFFECTS OF DEPTH AND MARINE RESERVE FISHING RESTRICTIONS ON THE STRUCTURE OF A ROCKY REEF FISH ASSEMBLAGE IN THE NORTH-WESTERN MEDITERRANEAN SEA. *J. Appl. Ecol.* 20(2):357-369. Aug. 1983. SFA 28(4)
[Sch. Biol. Sci., Macquarie Univ., North Ryde, N.S.W., 2113, Australia] A visual scuba diving census, in which abundance and size class structure of conspicuous fish species were determined, was used to assess the effects of depth and marine reserve fishing restrictions on the structure of Mediterranean rocky reef fish assemblage by comparing communities at sites from two depth ranges inside and outside a marine reserve. The total assemblage had thirty-five conspicuous species and was dominated by Labridae (thirteen spp.) and Sparidae (nine spp.). Mean species richness (number of species) and diversity (Shannon) did not differ significantly between sites. Ordination of abundance data showed that occurrence and relative abundance of species was affected by depth (deep samples separated completely from shallow samples) and marine reserve status (samples from the marine reserve were significantly separated from those taken at the same depth outside the reserve). Samples from the same depth were similar, because the majority of species showed a preference for either deep or shallow areas. The known biology of several species indicated that feeding requirements may be responsible for depth preferences. Samples from reserve sites had significantly higher densities of fish species sought after and/or vulnerable to local fishing methods, than those from non-reserve sites of similar depth. Size frequency distributions of vulnerable species at reserve sites generally had a larger modal size class than distributions from non-reserve sites. The data suggest that reduced fishing pressure in the reserve has provided effective protection for species vulnerable to fishing.

83-002832 Botsford, L. W.; R. D. Methot, Jr. and J. E. Wilen. CYCLIC COVARIATION IN THE CALIFORNIA KING SALMON, *ONCORHYNCHUS TSHAWYTSCHA*, SILVER SALMON, *O. KISUTCH*, AND DUNGENESS CRAB, *CANCER MAGISTER*, FISHERIES. *NOAA Fish. Bull.* 80(4):791-801. Oct. 1982. SFA 28(4)
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83-002833 Bukhanevich, I. B. [SOME ASPECTS OF THE ESTABLISHMENT OF MANAGEABLE FISHERIES IN THE CASPIAN AND AZOV SEAS.] *Biological Productivity in the Azov and Caspian Seas. VNIRO, Mowcow, USSR.* p. 5-12. 1982. In Russian with English summ. SFA 28(4)

83-002834 FAO of the UN. REPORT OF THE FOURTH SESSION OF THE SUB-COMMITTEE ON MANAGEMENT OF RESOURCES WITHIN THE LIMITS OF NATIONAL JURISDICTION. DAKAR, SENEGAL, 8-11 JUNE 1982. *FAO Fish. Rep.* No. 272. vi + 34p. 1983. SFA 28(4)
[Rome, Italy]

83-002835 FAO of the UN. REPORT OF THE THIRD SESSION OF THE WORKING PARTY ASSESSMENT OF MARINE FISHERY RESOURCES. KINGSTON, JAMAICA, 17-21 MAY 1982. *FAO Fish. Rep.* No. 278. v + 35p. 1983. SFA 28(4)
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83-002836 FAO of the UN. REPORT OF THE FOURTH SESSION OF THE COMMITTEE FOR THE DEVELOPMENT AND MANAGEMENT OF THE FISHERY RESOURCES OF THE GULFS. DOHA, QATAR, 19-21 APRIL 1982. *FAO Fish. Rep.* No. 276. v + 25p. 1983. In English and Arabic. SFA 28(4)
[Rome, Italy]

83-002837 Hanan, D. A. REVIEW AND ANALYSIS OF THE BLUEFIN TUNA, *THUNNUS THYNNUS*, FISHERY IN THE EASTERN NORTH PACIFIC OCEAN. *NOAA Fish. Bull.* 81(1):107-119. Jan. 1983. SFA 28(4)
[NMFS, P. W. Box 271, La Jolla, CA 92038]

83-002838 Loewinger, N. IMPROVING MULTIPLE USE OF COASTAL AND MARINE RESOURCES. INTRODUCTION AND SYMPOSIUM SUMMARY. *Fisheries (Bull. Am. Fish. Soc.)* 8(5):22, 24. Sept.-Oct. 1983. SFA 28(4)

83-002839 Overholtz, W. J. LONG-TERM TEMPORAL PERSPECTIVES FOR THE DEMERSAL FISH ASSEMBLAGES OF GEORGES BANK WITH IMPLICATIONS FOR MANAGEMENT AND MODELING. *Ph.D. dissertation, Oreg. State Univ.* 259p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(1):34. July 1983. SFA 28(4)

83-002840 Scogin, W. M., Jr. THE LICENSING OF MARINE RECREATIONAL FISHERMEN. *N. Am. J. Fish. Manage.* 3(3):276-282. 1983. SFA 28(4)
[NMFS, Fish. Stat. Prog., F/S21, Washington, DC 20235]

83-002841 Volovik, S. P. and S. V. Kozlitina. ASSESSMENT OF THE POTENTIAL CATCH OF THE AZOV ANCHOVY, *ENGRAULIS ENCRASICOLUS* (ENGRAULIDAE), IN RELATION TO GROWTH AND STRUCTURE OF ITS POPULATION. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(1):26-38. 1983. SFA 28(4)
[Moscow Hydrophys. Inst., USSR Acad. Sci., Sevastopol, USSR] On the basis of data obtained from 1932 to 1978, characterizing the structure of the population of the Azov anchovy (*Engraulis encrasicolus*) at various times of the annual cycle and its catches, and also the significance of various biotic and abiotic factors, assessments are made of some interrelationships, curves for the provision of the biomass of the population and the yield of under-yearlings are plotted, and growth features of year-classes differing in strength and values of natural and fishing mortality are explained. Based on

MARINE MANAGEMENT AND RESEARCH (CONTINUED)

83-002841 CONTINUED Beverton's and Holt's models, the greatest fishery efficiency can be obtained through the maximum use of anchovy from older groups, particulary 2nd-year fish.

MISC. TECHNIQUES AND EQUIPMENT

83-002842 Bannerot, S. P. and C. B. Austin. USING FREQUENCY DISTRIBUTION OF CATCH PER UNIT EFFORT TO MEASURE FISH-STOCK ABUNDANCE. *Trans. Am. Fish. Soc.* 112(5):608-617. Sept. 1983. SFA 28(4)
[NMFS, Southeast Fish. Cent., 75 Virginia Beach Dr., Miami, FL 33149]

83-002843 Flescher, D. D. FISH PHOTOGRAPHY. *Fisheries (Bull. Am. Fish. Soc.)* 8(4):2-6. July-Aug. 1983. SFA 28(4)
[NMFS, Northeast Fish. Cent., Woods Hole, MA 02543]

83-002844 Fowler, G. M. and S. J. Smith. LENGTH CHANGES IN SILVER HAKE (*MERLUCCIUS BILINEARIS*) LARVAE: EFFECTS OF FORMALIN, ETHANOL, AND FREEZING. *Can. J. Fish. Aquatic Sci.* 40(7):866-870. July 1983. In English with French summ. SFA 28(4)
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83-002845 Fuss, J. T. USING SINGLE BOARD COMPUTERS FOR CONTROL APPLICATIONS. *Fisheries (Bull Am. Fish. Soc.)* 8(5):8-13. Sept.-Oct. 1983. SFA 28(4)
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